# PATENTS FOR SOLDIERS

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MASTER OF MILITARY ART AND SCIENCE
General Studies

by

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Army leaders and doctrine describe innovation as an important pillar of today's and tomorrow's Army. At the pinnacle of innovation is the legally recognized protection of an innovative idea; that is, a patent. A Soldier's pursuit of patents provides the Army with tangible and intangible benefits. There are on average about 150 patents issued to the Army each year. This research aims to determine the extent that Soldiers are part of the inventorship of the Army's patents. It further aims to assess and evaluate the process that Soldiers are expected to follow as well as some of the Army's cultural dimensions that enable patentable innovation. This research concludes with recommendations that serve to better enable a Soldier's pursuit of patents.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

PATENTS FOR SOLDIERS, by Major Scott Browne, 196 pages.

Army leaders and doctrine describe innovation as an important pillar of today's and tomorrow's Army. At the pinnacle of innovation is the legally recognized protection of an innovative idea; that is, a patent. A Soldier's pursuit of patents provides the Army with tangible and intangible benefits. There are on average about 150 patents issued to the Army each year. This research aims to determine the extent that Soldiers are part of the inventorship of the Army's patents. It further aims to assess and evaluate the process that Soldiers are expected to follow as well as some of the Army's cultural dimensions that enable patentable innovation. This research concludes with recommendations that serve to better enable a Soldier's pursuit of patents.

# ACKNOWLEDGMENTS

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# ACRONYMS

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|---|---|
| AAMC | U.S. Army Aviation and Missile Command |
| ADM | Army Design Methodology |
| AMC | Army Materiel Command |
| AR | Army Regulation |
| ARDEC | Armaments Research, Development and Engineering Center |
| ARL | Army Research Laboratory |
| CECOM | U.S. Army Communications-Electronics Command |
| CY | Calendar Year |
| DA | Department of the Army |
| DoD | Department of Defense |
| ECBC | Edgewood Chemical and Biological Center |
| IED | Improvised Explosive Device |
| IPCA | Intellectual Property Counsel of the Army |
| MRMC | U.S. Army Medical Research and Materiel Command |
| NSRDEC | Natick Soldier Research, Development and Engineering Center |
| PAIR | Patent Application Information Retrieval |
| PatFT | Patent Full-Text and Image Database |
| SMDC | U.S. Army Space and Missile Defense Command |
| TACOM | Tank-automotive and Armaments Command |
| USCT | Under Secretary of Commerce for Technology |
| USALSA | U.S. Army Legal Services Agency |
| USMA | United States Military Academy |
| USPTO | United States Patent and Trademark Office |

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# CHAPTER 1

# INTRODUCTION

> When I hear that kind of thing, it reminds me of what the beaver told the rabbit as they stood at the base of the Hoover Dam: 'No, I didn't build it myself but it's based on an idea of mine.'
>
> — Jack Kilby, *The Innovators*

## Background

Sergeant Curtis Culin invented a device that some say won the Battle of Normandy.[1] The device, "Culin's cutter,"[2] solved the problem of poor mobility for tanks due to impenetrable hedgerows throughout Normandy. Culin's cutter featured forks secured to a crossbar that traversed the front of a tank. The tank, with the cutter attached, plowed through the hedgerows, thus enhancing mobility throughout Bocage country. Culin's invention is one of many examples of innovation on the battlefield, but more generally, his invention is an example of a Soldier's innovation that matured into an invention. Culin's invention put to practice "the [p]rogess of [s]cience and useful [a]rts"[3] through a device that improved a tank's mobility. Nearly 150 years before Culin's cutter tore through the French countryside, during the drafting of the U.S. Constitution, it was conceived to give Congress the power to promote inventions akin to Culin's. Nearly 75

[1] James J. Carafano, *GI Ingenuity, Technology and Winning World War II* (Westport, CT: Praeger Security International, 2007), 126.

[2] Ibid.

[3] U.S. Constitution, art. 1, sec. 8, cl. 8.

years after Culin's invention, it is worth exploring whether the U.S. Army sufficiently captures such inventions; i.e. inventions by Soldiers, by maturing them into patents.

Patents represent the consummation of a Soldier's desire to improve the materials and equipment they employ to accomplish their mission. The issuance of a patent reflects a Soldier's journey along an avenue that intersects with numerous topics of interest to any military professional. These topics include: innovation, mission command, the army design methodology (ADM), history, collaboration, and organizational culture. Further, the U.S. Constitution and various laws represent intersections through the Soldier's march down the patent-avenue.

Innovation represents the spirit of accomplishing a mission in an atypical manner. This atypical manner generally includes an element of originality or newness. However, sometimes innovation is taking something old and making it new again.[4] Innovation is critical; former Army Chief of Staff Ray Odierno says innovation is "need[ed] to ensure that [the Army's] Soldiers, leaders, and teams are prepared to win in a complex world."[5] It is required for the U.S. Army to achieve overmatch of its enemies.[6] It is one of the eight tenets prescribed for commanders to consider while conducting the operations process.[7] Innovation exists in many forms: a new idea, a different way of organizing

[4] Walter Isaacson, *The Innovators, How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution* (New York: Simon and Schuster, 2014), 390.

[5] Training and Doctrine Command, TRADOC Pamphlet 525-3-1, *The U.S. Army Operating Concept-Win in a Complex World* (Fort Eustis, VA: U.S Government Printing Office, October 31, 2014), 3.

[6] Ibid., iv.

[7] Ibid., 28-29.

teams, a quicker—yet effective—way of accomplishing a task, or an invention. It is inventions that are the heart of this paper; specifically, patentable inventions. That is, inventions, by Soldiers, that the United States Patent and Trademark Office (USPTO) stamps as comprising a "new and useful [product] . . . or any new and useful improvement thereof."[8]

Patentable inventions form the summit of innovation. The summit, unlike innovation in general, demands originality; it demands something never thought of before. In order to reach the summit of innovation a Soldier must have the freedom to innovate. The army's leadership philosophy of mission command provides such freedom.

Mission command enables innovation. The use of mission orders, one of the six principles of mission command, wherein a leader directs "the results to be attained, not how [subordinates] are to achieve them"[9] inherently provides the space for innovation to mature. Soldiers, through exercising disciplined initiative, another one of the six principles, invent solutions to problems. It is only with a disciplined initiative that effective inventions are born. This is the same kind of initiative that enabled Culin to invent the cutter. The development of the cutter was fostered by another principle of mission command: create a shared understanding. The cutter was developed in response to a shared understanding of the problem of Bocage country and some possible approaches to solving the problem. And, the base principle of mission command, building cohesive teams through mutual trust, is a highly effective way to innovate. The

[8] 35 USC § 101.

[9] Department of the Army, Army Doctrine Publication (ADP) 6-0, *Mission Command* (Washington, DC: Government Printing Office, 2012), 5.

invention of the computer, for which the Army is generally given credit, was the product of such a cohesive team.[10]

> [T]he main lesson to draw from the birth of computers is that innovation is usually a group effort, involving collaboration between visionaries and engineers, and that creativity comes from drawing on many sources. Only in storybooks do inventions come like a thunderbolt, or a lightbulb popping out of the head of a lone individual in a basement or garret or garage.[11]

Lastly, with respect to mission command, innovation often includes another mission command principle: acceptance of prudent risk. In fact, innovation demands "[Soldiers] who are willing to take risks."[12] Put another way, the avoidance of risk is one of the reasons that organizations fail to innovate.[13] Accepting prudent risk, and any accompanying failure, is a "fundamental point"[14] for any innovative organization because innovation "push[es] boundaries."[15] The principles of mission command clearly align themselves with innovation. The employment of mission command bridges this

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[10] Isaacson, *Innovators*, 72.Specifically, the Army is generally credited with the development of the Electronic Numerical Integrator and Computer (ENIAC).

[11] Isaacson, *Innovators*, 85

[12] Williamson Murray, "Innovation: Past and Future," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996), 326.

[13] Clayton M. Christensen, *The Innovator's Dilemma* (New York: HarperCollins, 2000), 34.

[14] Pierre Chao, interview by Army AL&T magazine, "What Kind of Innovation do you Want?" *Army AL&T Magazine* (October-December 2015), 111, accessed October 12, 2015, http://usaascinfo.info/docs/armyalt-oct-dec-15-o.pdf.

[15] Ibid.

leadership philosophy to the execution of missions as initially conceptualized through ADM.

ADM provides a framework to understand, visualize, and describe problems and approaches to solving them.[16] As such, ADM also provides a tailored framework for developing patentable innovation. Patents in their issued form, describe a problem with a particular product, often illustrate such a problem (through visually depicting prior art), and provide approaches to solving the problems (through an improved device).

U.S. Patent 8,789,469, to Evangelisti et al., "grenade pull pin assembly," provides a good example of how a patent employs ADM.[17] The current environment of problems associated with hand grenade pull pins are described on page 5 of the patent. Specifically, their removal, primarily due to their ability to be re-used, is subject to an unpredictable amount of force, thereby enabling their inadvertent removal. Further, when the pin is assembled within the grenade fuze, its edges are exposed and may injure a Soldier. The current state, or prior art, of the pull pin is visually depicted in figures 1 and 2.[18]

[16] Headquarters, Department of the Army, Army Techniques Publication 5-0.1, *Army Design Methodology* (Washington, DC: Government Printing Office, 2015).

[17] This patent and all patents referenced herein may be accessed through the USPTO's Patent Application Information Retrieval site at http://portal.uspto.gov/pair/PublicPair.

[18] The word "prior" is used relative to the date that a patent application is filed.

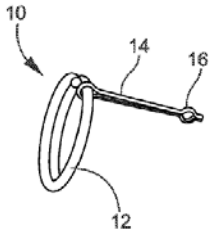


Figure 1. U.S. Patent 8,789,469, Figure 1, Prior Art

*Source*: Matthew Evangelisti and Steve Kotefski, "Grenade Pull Pin Assembly," U.S. Patent No. 8,789,469 (Alexandria, VA: U.S. Patent and Trademark Office, July 29, 2014).

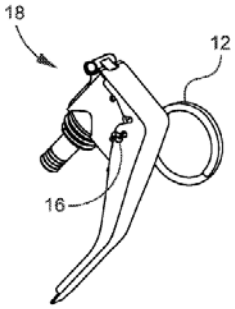


Figure 2. U.S. Patent 8,789,469, Figure 2, Prior Art

*Source*: Matthew Evangelisti and Steve Kotefski, "Grenade Pull Pin Assembly," U.S. Patent No. 8,789,469 (Alexandria, VA: U.S. Patent and Trademark Office, July 29, 2014).

The inventors of the grenade pull pin assembly solve the problems described above with an approach of replacing a "duckbill"[19] shape on the pull pin with a technique wherein the free ends of the pull pin are twice bent as illustrated in figure 3. This

[19] Matthew Evangelisti and Steve Kotefski, "Grenade Pull Pin Assembly," U.S. Patent No. 8,789,469 (Alexandria, VA: U.S. Patent and Trademark Office, July 29, 2014).

improved pull pin lacks exposed edges when assembled within the fuze. Further, the likelihood of its inadvertent removal is greatly reduced. This patent solves a specific problem through a patentable innovation. History is replete with problems that must be solved by Soldiers; often by way of a patentable innovation.

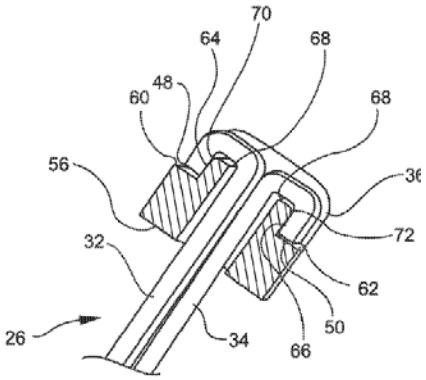


Figure 3. U.S. Patent 8,789, 469, Figure 7C

*Source:* Matthew Evangelisti and Steve Kotefski, "Grenade Pull Pin Assembly," U.S. Patent No. 8,789,469 (Alexandria, VA: U.S. Patent and Trademark Office, July 29, 2014).

Any historical analysis of the wars of the past couple of centuries necessarily involves a study of the impact of inventions on war. The Civil War featured a trifecta of critical inventions: the telegraph, railroad, and rifle. World War II featured Culin's cutter. Vietnam featured the artillery speed shifter, an invention that enabled a more versatile and effective defense of U.S. bases. The conflicts in the Middle East featured devices to counter the improvised explosive device threat.

A review of patentable innovations throughout history is not limited to innovations that occur during periods of conflict. It extends to the maturation of one

technology and the conditions that are ripe for such maturation. The evolution of the hydraulic excavator serves as a prime example.[20] The hydraulic excavator story provides an example of an enduring invention whose large scale value was not immediately evident. It serves as a reminder that marginalizing an invention because of its foreseen lack of profitability, or as not entirely useful given current conditions, can have harsh consequences.

A study of patentable innovation throughout history is important for many reasons. First, it underscores the value of technical overmatch. The actor possessing such often prevails. Second, it inspires future generations of Soldiers to continue to churn the gears of innovation in order to overcome challenges and problems on the battlefield. Third, it instills in Army leadership the value of mission command with respect to enabling subordinates the space to innovate. Fourth, when Soldier's inventions are looked at from afar, common elements of most historical examples emerge. These elements will be discussed in greater detail herein, but a paramount element, as briefly hinted above in the evolution of the computer, is that of collaboration.

[20] Christensen, 77. Christensen describes the so-called disruptive technology of hydraulics as introduced for use on excavators. Traditionally, the excavator was steam powered with its bucket enabled by cables. The so-called sustaining technology of gasoline and diesel engines replaced the steam engines. Gasoline and diesel engines, though radical, still enabled the desired performance characteristics: 360-degree rotation of the cab, large capacity of the bucket, and an ideal reach. The introduction of hydraulics did not enable these; the bucket capacity was reduced; the reach was reduced; and it was only able to rotate 180 degrees. As such, the major users of excavators had no use for hydraulics. However, these hydraulic excavators, and their limitations, gained appreciation and interest by those needing to dig small and precise trenches in the construction of housing communities. Over time, the companies that remained loyal to the non-hydraulic excavators were outpaced by those that exploited the hydraulic ones.

Collaboration that produces patentable innovation occurs in many forms though three forms deserve immediate attention. First, collaboration occurs across the warfighter functions.[21] The development of Culin's cutter comprised elements of the movement and maneuver and sustainment warfighter functions. Movement and maneuver was at the heart of the cutter; the cutter was improved to overcome the challenges of terrain to attain a positional advantage over the enemy. Sustainment enabled the material for the cutter as described in chapter 2.

Second, collaboration occurs between Soldiers and the scientists and engineers employed by the Army's research organizations.[22] The development of the radar is an example of this collaboration wherein "the interaction of military personnel and civilians both at the [research center] and out in the field was by all accounts constructive and mutually beneficial."[23]

Third, collaboration occurs between the inventors and Army counsel through the patent application process. It is through this process that Army counsel evaluates whether the Solider can own their invention outright, or whether their ownership must be assigned

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[21] Department of the Army, Army Doctrine Publication (ADP) 3-0, *Unified Land Operations* (Washington, DC: Government Printing Office, 2011), 13-14.The warfighting functions are mission command (generally described as the act of applying the previously described mission command leadership philosophy along with various command and control tools, techniques, and procedures), movement and maneuver, intelligence, fires, sustainment, and protection.

[22] The term Army research organization is used herein to describe, primarily, the various organizations of scientists, engineers and support staff that are under the Army Materiel Command (AMC).

[23] Alan Beyerchen, "From Radio to Radar," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996), 293.

to the Army. Critically, counsel also evaluate the merits of spending resources in time and money to pursue patent protection for a Soldier's invention.

It is also through this collaboration that Army counsel refines a patent application to comply—in form and substance—with USPTO requirements. Form requirements include a catalogue of procedural requirements such as the provision of drawings that adequately capture, and visually describe, the invention.[24] Substantive requirements include refining a patent application's claims—the true property rights of the invention—to overcome existing prior art. In other words, the claims must define a device that is, among other things, "new and useful."[25]

Most patentable innovations will comprise of each of these three forms of collaboration at some stage of the patent application process. This collaboration, particularly the third form of collaboration, triggers the Army's bureaucracy of decisions that determine the mortality or survivability of a Soldier's invention. It is here, that the Army's cultural flag for innovation starts to unfurl.

The cultural flag for innovation is understood through a framework described by renowned culture analyst, Edgar Schein. Schein describes the layers of an organization's culture. These layers are explored in chapter 2 herein along with the hallmarks of cultures that foster, or fail to foster, innovation. This material is then compared and contrasted with the Army's culture, or lack thereof, for fostering innovation in chapter 4. An

[24] The Manual of Patent Examining Procedure provides a comprehensive summary of procedural requirements associated with the patent application process.

[25] 35 U.S.C. § 101; further, as explained in chapter 2, patents are not limited to devices, or products, but this category of patents is the most common type of invention conceived of by a Soldier.

example of a component of the Army's culture is the above-described philosophy of mission command. Another example of the Army's culture is the notion that the Army does best, what serves it well; so, the beneficial value of patentable innovations is explored. This value is addressed in tangible (monetary) and intangible (e.g. recruiting benefits) ways.

At the foundation of the discussion of the interplay between history, collaboration, and culture, as they are aligned with patentable innovations, lies the Constitution, federal law, and Army regulations (ARs). This foundation is reviewed in chapter 2 with a background in patent law, overarching federal statutes, and a review of the few ARs that grease the wheels of the patent application process.

The Army captures the ideas of its scientists and engineers assigned to its numerous research organizations. These ideas are matured into patents through the process of the research organization's patent attorney drafting a patent application and filing it with the USPTO. Once the USPTO examines the application and adjudicates the invention described therein as patentable, a patent is issued. In 2015, the USPTO issued 169 patents to the Army.[26] Out of these 169 patents, few, if any, include Soldiers as named inventors. Instead, the substantial majority of named inventors of the 169 patents were the scientists and engineers assigned to the Army's research organizations.

[26] Patent Full-Text Image Database, United States Patent and Trademark Office, accessed December 14, 2015, http://patft.uspto.gov/netahtml/PTO/index.html. The following search terms are entered to obtain this statistic: "APT/1 AND AN/army AND AN/united AND ISD/2015$." *See* Appendix C for a listing of each of these patents.

## Research Question

The primary question of this research is: Does the U.S. Army's regulations and culture adequately foster a Soldier's pursuit of patentable innovations? An attempt to answer this question prompts the following secondary questions:

1. What is the Army's patent application process for Soldiers in the field?
2. Are Soldiers in the field capable of developing patentable inventions?
3. Of the patents that are issued to the Army, how often is a Soldier named as an inventor?
4. Do patentable innovations benefit Soldiers, individually, as well as the Army, as an organization?
5. What are the characteristics of a culture that fosters the maturation of ideas into patents?

## Assumptions

There are several important assumptions that enable this research. First, the data accessible to the public from the USPTO regarding issued patents is assumed to be accurate. This data is relied on to determine the research organization that prosecuted a particular patent as well as each patent's named inventors. Second, characteristics of Soldiers in the past predicts characteristics of Soldiers in the future. Part of this research will examine the history of Soldiers' inventions. This part of the research generally documents the past hundred years of Soldier-inventors. Third, all inventions of Soldiers related to their military duties are disclosed to the Army. That is, Soldiers do not hide from the Army their duty-related innovations that mature into patent applications.

Definition of Terms

Adjudication: an evaluation of a patent application performed by the USPTO as to whether the invention disclosed in the application is patentable.

Army research organization: any of the patent prosecuting subordinate research and development commands or centers of the Army Material Command such as the Research Development and Engineering Command, U.S. Army Communications-Electronics Command, Tank-automotive and Armaments Command, Armaments Research, Development and Engineering Center, Edgewood Chemical and Biological Center, Army Research Laboratory, Tank Automotive Research, Development and Engineering Center and the Natick Soldier Research, Development and Engineering Center, along with the subordinate research centers and laboratories of the U.S. Army Corps of Engineers, Medical Research and Materiel Command, Aviation and Missile Command, and the Space and Missile Defense Command.

Assignee: the party that receives the property interest of a patent, and can thus enforce such.

Copyright: a property right that enables its owner to prevent others from copying, selling, performing, displaying, or making derivative versions of a work of authorship.[27]

Cooperative Patent Classification: A system of organizing patents based on the subject matter of the patent as now shared by the European Patent Office and the

[27] Alexander Poltorak and Paul Lerner, *Essentials of Intellectual Property*: *Law, Economics, and Strategy* (Hoboken, NJ: John Wiley and Sons, 2011), 28.

USPTO.[28] For example, the classification for a device on a weapon that receives a sling is F41C 23/02. Cooperative Patent Classification Section F is one of 9 Cooperative Patent Classification sections that cover everything that is patentable. Specifically, section F represents mechanical engineering; lighting; heating; weapons; and blasting engines or pumps. Class F41 represents weapons. F41C represents small arms, e.g. pistols or rifles. Subclass 23 represents butts; butt plates; and stocks (of a weapon). Subgroup 02 represents the attachment of slings.

Issue: in the context of patents, the action of delivering a patent, and its rights, to the patent's assignee, or, if not assigned, its owner.

Non-provisional patent application: a patent application that is filed with the USPTO that is generally ready for adjudication by the USPTO.

Patent: a property right issued by the USPTO to an inventor in recognition of a novel, non-obvious, and useful invention as documented on a patent application that enables the inventor to exclude others from using or making their invention.

Patent application: a non-provisional or provisional application to the USPTO for an adjudication as to the patentability of an invention.

Patent attorney: an attorney that is licensed to practice law in one of fifty states in the U.S. and is additionally licensed, through the issuance of a registration number, to prosecute patents with the USPTO.

Patent examiner: an employee of the USPTO that examines a patent application and performs an adjudication on behalf of the USPTO.

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[28] United States Patent and Trademark Office, *Cooperative Patent Classification*, accessed May 4, 2016, http://www.uspto.gov/web/patents/classification/cpc.html.

Patent prosecution: the pursuit, generally performed by a patent attorney, as the inventor's legal representative, of obtaining a patent through written and oral dialogue with the USPTO regarding a specific patent.

Provisional patent application: a patent application that is complete enough for filing with the USPTO, but not complete enough for an adjudication by the USPTO as to whether the invention disclosed therein is patentable.

Soldier: a member of the U.S. Army that is assigned to either the Army Reserves, Army National Guard, Army Forces Command, or one of the Army Service Component Commands; particularly, not servicemembers assigned to Army Materiel Command.

Trademark: a word, symbol, or combination thereof that is used to identify the source of goods.[29]

Trade secret: information that is not generally available and that confers a competitive advantage upon its possessor.[30]

United States Patent Classification System: The system formally used by the USPTO for organizing patents by subject matter.[31] The system is made up of classes and subordinate sub classes. As an example, 2/456 comprises class 2 and subclass 456. Class 2 represents apparel and subclass 456 represents body cover. On January 1, 2015, the USPTO suspended use of this system in favor of the Cooperative Patent Classification.

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[29] Poltorak and Lerner, *Essentials of Intellectual Property*, 22.

[30] Ibid.

[31] United States Patent and Trademark Office, *Overview of the U.S. Patent Classification System*, December 2012, accessed May 4, 2016, http://www.uspto.gov/sites/default/files/patents/resources/classification/overview.pdf.

## Limitations

There are two main limitations to this research. The first limitation is that there is minimal literature concerning Soldier's inventions that mature into patents. The second limitation is that this research is generally limited to issued patents as opposed to patent applications. Patent applications are not necessarily complete and accurate representations as to the actual inventors and assignees. Further, the collection of applications that, as a whole, thereby display current research and development priorities is generally confidential and not freely disclosed by organizations. As such, for purposes of this research, patent applications will be explored only to provide context to a given set of circumstances when appropriate.

## Scope and Delimitations

There are numerous delimitations in this research. First, intellectual property is a broad title that includes patents, copyrights, trademarks, and trade-secrets. This research is solely limited to patents and thus does not include copyrights, trademarks, or trade-secrets. Second, references to the Army's patent application process, unless otherwise expressly stated, applies only to the Army's Soldiers; not necessarily the process followed by the Army's scientists and engineers; particularly, those employed by the Army Materiel Command (AMC). In other words, the patent application process within AMC is not explored; whereas the patent application process for a Soldier is an area of focus for this research. Third, this research does not explore any international issues related to patents such as filing patent applications in foreign countries or issues related to an international patent office such as the World Intellectual Property Organization. Fourth, this research does not explore, with the exception of peripheral discussions,

licensing and technology transfer. This issue, while important to the value of patents, is beyond the reach, and mission, of Soldier-inventors. Accordingly, the concept of the "valley of death,"[32] and how a patentable innovation can successfully traverse this valley, while certainly critical to the commercialization of patentable innovations, is not explored herein. Fifth, this research only considers laws and regulations that are current as of January 1, 2016. Sixth, interviews were generally not conducted due to time constraints, procedural requirements, and a respect for the burden placed on interviewees as a result of such interviews. Seventh, there are many types of patents as explained in chapter 1; the only types of patents explored herein are those that relate to a product or device. Eighth, this research only discusses information that is unclassified and readily accessible to the public. Ninth, this research only explores patents issued to the Army. There may be patents that are prosecuted by Army research organizations at some point during a patent's prosecution that are eventually issued, but are issued to an organization other than the U.S. Army.

## Significance of Study

Patentable innovation ties in many concepts of Army innovation from mission command to ADM. The roots of patentable innovation is in history, organizational culture, and effective collaboration between the Soldier-inventor and their fellow service members, uniformed and civilian. The extent of patents getting issued to the Army with Soldiers named as inventors provides a way to effectively measure the current state of

[32] Shantha Liyanage, *Serendipitous and Strategic Innovation: A Systems Approach to Managing Science-Based Innovation* (Westport, CT: Praeger Publishers, 2006), 4.

Army innovation. After all, Army leadership recently stated that "we need to increase the rate of innovation."[33]

## Summary

Chapter 1 introduces the research and provides a brief background regarding patents, innovation, and how this topic aligns with Army operations. The inventorship of the Army's Soldiers is the focus of this research. The inventorship of the Army's scientists and engineers, while providing much needed context for this research, is not the focus. Chapter 2 provides a history of Soldiers inventing devices to better improve their ability to fight while also exploring many of the topics briefly introduced in chapter 1 in greater detail such as the Army's pursuit of innovation, the requirements for obtaining a patent, the Army's process for applying for a patent, and the culture that fosters the pursuit of patents. Chapter 3 introduces the methodology used for this research. Chapter 4 expresses results of the research, analyzes the information provided herein, and purports to answer the primary research question and the secondary research questions. Chapter 5 offers some conclusions and recommendations.

[33] Lieutenant General Robert Brown, "The Human Dimension" (Speech, Command and General Staff College, Fort Leavenworth, September, 11, 2015).

# CHAPTER 2

# LITERATURE REVIEW

> If you introduce that thing you'll take all the fun out of flying![34]
>
> — Luftwaffe General Ernst Udet

This chapter is divided into five separate sections. Each section corresponds with an area of literature explored for this research. First, a background of patent law helps to appreciate some of the challenges of obtaining a patent. Second, the Army's patent application process for Soldiers is explored. Third, the importance of innovation to the Army is delved into. Fourth, is a review of the type of culture that fosters innovation. Fifth, is a review of the tangible and intangible benefits of pursuing patents. Lastly, this research reviews the past and current environments with respect to Soldier-inventors.

## Patentability

The definition section of this research provides a definition of a patent. It is understood by many that a patent is associated with prestige because a patent is hard to obtain. A patent is hard to obtain because there are several gates that must be navigated through in order to obtain one. These gates are notwithstanding any additional institutional gates imposed within an organization such as the Army. These institutional gates are reviewed below in a later discussion. So, notwithstanding institutional gates, the other gates may be divided into two types: those imposed by law through statutes and

[34] Beyerchen, 272.

case law, and those imposed by the USPTO through rules and regulations. [35] This review is meant as an overview of the main gates that must be cleared in order to obtain a patent. The first gates are those imposed by federal statute under Title 35 of the U.S. Code.[36]

35 U.S.C. § 101: Inventions Patentable

This statute[37] comprises three gates, albeit probably the easiest gates, to obtaining a patent for a product. First, the invention must be "new and useful."[38] This first gate simply requires that the invention is not something old. After all, sometimes innovation involves recovering that which is old, and making it new again.[39] In patent language, if an alleged invention is in fact, old, it is said to be anticipated by the prior art. Prior art is an umbrella term for a wide spectrum of media that previously disclosed the alleged invention. Such media may include magazine articles, websites, videos, prior-issued patents, and books.

Second, the invention must be useful. The usefulness of an invention is a "credible assertion of specific and substantial utility."[40] The assertion is either made

[35] 35 U.S.C § 2 confers the USPTO with the responsibility to grant and issue patents.

[36] These laws are relatively new as a result of the Leahy-Smith America Invents Act. As such these laws apply to patents with an effective filing date on or after March 16, 2013.

[37] The statute reads "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions of this title."

[38] 35 U.S.C. § 101.

[39] Isaacson, *Innovators*, 390.

[40] Manual of Patent Examining Procedure, §2107 (9th ed., rev. 07.2015).

expressly in the narrative portion of a patent application or the assertion is implied through "a readily apparent well-established utility[.]"[41] A mere assertion by the inventor satisfies this requirement. The usefulness of inventions is largely subjective so it is worth identifying inventions that lack a credible assertion. An assertion is not credible if it is "wholly inconsistent with contemporary knowledge in the [field of which the patent applies to]"[42]or the assertion violates basic laws of nature or thermodynamics.

The third gate imposed by this statute is probably the most practical. This third gate establishes that the invention must be a "process, machine, manufacture, or composition of matter."[43] In general, this is defined as "anything under the sun that is made by man."[44]

Each category can be defined with greater detail. A process is a "[s]eries of steps or acts" [45] to be performed. A machine, manufacture, or composition of matter are "things" or "products."[46] A machine is "a concrete thing, consisting of parts, or of certain devices and combination of devices."[47] Manufacture is "an article produced from raw or prepared materials by giving to these materials new forms, qualities, properties, or

[41] Ibid.

[42] Ibid.

[43] 35 U.S.C. § 101.

[44] *Diamond v. Chakrabarty*, 447 U.S. 303, 206 USPQ 193 (1980).

[45] Manual of Patent Examining Procedure, §2106 (9th ed., rev. 07.2015).

[46] Ibid.

[47] Ibid.

combinations, whether by hand labor or by machinery."[48] Composition of matter is "all compositions of two or more substances and all composite articles, whether they be the results of chemical union, or of mechanical mixture, or whether they be gases, fluids, powders or solids, for example."[49]

35 U.S.C. § 102: Conditions for patentability; novelty

This statute provides greater detail to the concept of prior art as described above, but it also imposes another gate. This fourth gate requires that any prior disclosures related to the invention must be within a year prior to the effective filing date of its respective patent application. In effect, this fourth gate is a statutory bar that prohibits an inventor to obtain a patent, on, for example, a product if the product was disclosed more than a year prior to the application's filing date. This statute provides insight into what qualifies as a disclosure. In essence, a disclosure is an act of making the invention available to the public at large, intentionally or unintentionally. To the contrary, the mere discussion of an invention with a peer generally does not qualify as a disclosure. However, the posting of a YouTube video disclosing a product would likely qualify as a disclosure. Accordingly, if the inventor posts a video of their invention, allows a year to elapse before filing an application, then the inventor is probably prohibited from obtaining a patent for their disclosed invention.

[48] Ibid.

[49] Ibid.

35 U.S.C. § 103: Conditions for patentability; non-obvious subject matter

This statute is the least objective. Therefore, its gate tends to be subjective. This fifth gate can be traversed so long as the invention is not merely an obvious improvement to a known device. The perspective of obviousness is from one having ordinary skill in the art to which the subject matter pertains. For example, if the subject matter concerns a pharmaceutical, then the perspective of obviousness is from one having ordinary skill with pharmaceuticals; i.e. not a plumber. The manual of patent examining procedures identifies a series of modifications to inventions that are generally adjudicated to include obvious improvements, and therefore they are not patent-worthy. These "rationales" that support a conclusion of obviousness, and thus unpatentability, are:

> (A) Combining prior art elements according to known methods to yield predictable results;
>
> (B) Simple substitution of one known element for another to obtain predictable results;
>
> (C) Use of known technique to improve similar devices in the same way;
>
> (D) Applying a known technique to a known device ready for improvement to yield predictable results;
>
> (E) "Obvious to try" – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
>
> (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
>
> (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.[50]

[50] Manual of Patent Examining Procedure, §2141 (9th ed., rev. 07.2015)

In summary, these five gates are the primary gates that must be navigated through to enable a patentability adjudication.[51] In short, there are enough nuances in patent law to warrant 896 pages of text in a 2007 patent law casebook.[52] This section merely provides the reader with the core statutory provisions regarding patentability and the main gates that must be navigated through to obtain a patent.[53]

## The Patent

Just as it is helpful for any Soldier to be familiar with the terrain of an upcoming mission, it is helpful for a Soldier-inventor to know the terrain of an actual patent. The manual patent of examining procedures, along with the Code of Federal Regulations establish the procedural requirements for patents. These procedural requirements can be said to form the skeleton of a patent. Most skeletons of patents are identical. Where they differ is the depth of information illustrated and disclosed. The grenade pull pin assembly will be used to demonstrate the skeleton of a patent.

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[51] Craig Nard, *The Law of Patents* (New York: Aspen Publishers, 2008), 49. Not to be dismissed are the requirements of 35 U.S.C. § 112. Nard notes that these requirements are "perhaps the most important of any of the patentability requirements and are at the heart of patent law's goal of promoting the progress of the useful arts." These requirements are not explored in detail herein because they are concerned with the content of the patent application, as influenced by a patent attorney, as opposed to the content of the actual invention. The requirements, in general, ensure that the invention is sufficiently disclosed and precisely claimed.

[52] See Craig Nard, *The Law of Patents* (New York: Aspen Publishers, 2008).

[53] As such, any prospective inventors should always seek the advice of counsel to determine their rights and how the various statutory provisions may or may not impact the patentability of an invention.

The patent cover page comprises the title of the invention, the inventors, the date of issuance, the date that the application was filed, the name of the attorney(s) that advocated to the USPTO for the patentability of the invention, and the assignee. The assignee is the entity that owns the rights to the patent. As discussed in a later section, for Soldier-inventors, this entity is the Federal Government, as represented by the Secretary of the Army. This means that the U.S. Government owns the rights to the invention if it is the assignee. Also on the cover page is the name of the patent examiner who is the USPTO official that evaluates the patentability of the invention. Lastly, the cover page usually includes an illustration that depicts the invention along with a brief overview of the patent in the form of an abstract.

After the cover page are various illustrations that describe the invention and, in some cases, the prior art. As evident from the pull pin assembly patent, if the illustration purports to show prior art, it must be labeled as such (so as not to confuse it with the current invention). The figures in the patent have numerous reference characters that aid a reader of the patent in understanding the invention. For each number, there should be a corresponding component describing it in the text. Likewise, each component described in the text should be illustrated.

The text of the patent, generally referred to as the disclosure, comprises two main parts. The first part is the specification. The second part is the claims. The specification establishes a background of the invention that generally identifies the problem that the invention purports to solve. The next two parts of the specification comprises an overview of the invention followed by an overview of each of the drawings. Next, comes a detailed description of the invention with constant cross references to the illustrations.

As an aid to understanding the illustrations, and the invention, it helps to annotate next to each reference character in the illustrations. For example, it is helpful to annotate "fuze body" next to reference character 22 especially since this is one of the main components of the invention.

After the specification is the "metes and bounds"[54] of the invention: the claims. For the grenade pull pin example, there are 18 claims. Many of the claims reference a preceding claim. These are known as dependent claims. They depend on the claim described therein which is known as an independent claim. For this example, there are 2 independent claims and 16 dependent claims. The claims serve as different ways of establishing the metes and bounds of a particular invention. A careful review of claims yields the accurate conclusion that the only inventive concept included in the claims is that of the structure. There is, and should not be, any language in the claims that purports to describe the use of the structure. In other words, the functional use of a product is not patentable. Accordingly, a patent cannot be awarded for similar products due to a different function of the product.[55]

## The Inventor

As discussed in this research, the pursuit of a patent is a collaborative effort. One claim may feature an idea of one inventor, while another claim may feature an idea by a

[54] Manual of Patent Examining Procedure, §2171 (9th ed., rev. 07.2015).

[55] This concept should not be confused with functional elements as described in detail in a recent law review article. Tom Brody, "Functional Elements in Patent Claims, as Construed by the Patent Trial and Appeal Board (PTAB)," *John Marshall Review of Intellectual Property Law* 13 (2014): 251-320, accessed May 8, 2016, http://repository.jmls.edu/cgi/viewcontent.cgi?article=1323&context=ripl.

second and a third. Alternatively, a single claim may be the product of multiple inventors. In such a case, the patent as a whole will name each inventor. With such collaborative efforts, a question may arise regarding to what extent a named inventor must actually contribute to the invention. This question yields "one of the muddiest concepts in the muddy metaphysics of the patent law."[56] One inventor may contribute a significantly greater amount of time, research, and funds into an invention relative to another inventor.[57] However, both inventors are named on the patent in the same size font and the latter inventor may in fact be the first named inventor, particularly if there is an organizational policy of naming inventors alphabetically.[58] In order to reach the threshold of a named inventor, said inventor must:

> (1) contribute in some significant manner to the conception or reduction to practice of the invention, (2) make a contribution to the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention, and (3) do more than merely explain to the real inventors well-known concepts [or] the current state of the art.[59]

Although the guidance for reaching the threshold of inventorship may be "muddy," the consequence of getting it wrong is not.

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[56] *Jamesbury Corp. v. U.S.*, 518 F.2d 1384, 1396 (Ct. Cl. 1975).

[57] 35 U.S.C. § 116(a).

[58] There are no rules or regulations that dictate the listing of names on a patent. The first named inventor however is the name often associated with references to the patent.

[59] *Pannu v. Ioloab Corp.*, 155 F.3d 1344, 1351 (Fed. Cir. 1998).

The failure to properly name the inventors can result in a legal challenge to its validity.[60] An example of such is provided by *Hess v. Advanced Cardiovascular Systems, Inc.* (hereinafter referred to as "Hess").[61] In *Hess,* an alleged co-inventor, suggested a material with certain characteristics to the named inventors that, in their research and development process, were searching for such a material to develop a catheter. The named inventors conducted extensive research and demonstrations with this material subsequent to the suggestion. The named inventors ended up using this material for their catheter and obtained a patent. The alleged co-inventor later sought correction of the inventorship to be a named inventor due to his contribution. The alleged co-inventor needed to establish by clear and convincing evidence that he should have been one of the named inventors. The court ruled that this burden was not met. It is important to note that the court did not rule whether the original inventorship was correct; rather, it ruled simply that the burden of proof was not met.

## The USPTO Process

As discussed above, inventions are assessed for patentability and, if warranted, issued as patents by the USPTO. The process of a patent application maturing into an issued patent is a lengthy process that inventors should be aware of. As noted, the process as discussed herein is concerned with the series of events that commence with the filing of a patent application. As with any invention, there is much that occurs from the time an

[60] *See* 35 U.S.C. § 256 wherein if the inventorship is not corrected in accordance with this section, once a patent is issued, it may be invalidated.

[61] This case involves a complicated procedural history wherein, in a related case, the invalidity of the patent was asserted.

inventive idea is thought of, to the point of drafting a patent application, but those events are not explored herein.

As for filing, it is important to note that given two inventors with the same invention unbeknownst to either of them, the first one to file a patent application for the invention, is the inventor that receives a patent for the invention. This is important, because in years past, the inquiry went not into which inventor filed first, but into who actually invented the product first. This applies to all patent applications filed as of March 16, 2013.[62]

Once the patent is filed, it is reviewed for basic technical requirements while awaiting an examination by a patent examiner. The patent examiner ensures the patent application complies with federal statutes, the Code of Federal Regulations, and assesses whether the application, in its current form, merits the issuance of a patent. Generally, a patent application, in its originally filed form, does not merit the issuance of a patent.[63] The patent examiner may find some procedural issues with the form of the application. Furthermore, the examiner may determine that the claims are drafted too broad.

More specifically, the claims may be drafted broad enough that they, upon their broadest reasonable interpretation, claim an invention already publicly disclosed, beyond that which the inventor intends to patent. If this is the case, the examiner will issue a non-

[62] United States Patent and Trademark Office, "First Inventor to File (FITF) Resources," accessed May 1, 2016, http://www.uspto.gov/patent/first-inventor-file-fitf-resources.

[63] Michael Carley, Deepak Hegde, and Alan Marco, "What is the Probability of Receiving a US Patent" (USPTO Economic Working Paper, January 2014), 4, accessed April 29, 2016, http://www.uspto.gov/ip/officechiefecon/OCE_WP_2013-2.pdf.

final rejection notice. The inventor, usually through a patent attorney, amends the claims so they are not as broad as originally drafted. Obviously, if there are procedural requirements those will be addressed, and amended, too. It is critical to note that an amendment cannot introduce "new matter."[64] That is, the amendment cannot purport to disclose a feature of the invention that was not included in the application as originally filed. Ideally, upon narrowing the claims, the claimed invention may now be patentable.

In reality, the claims in their amended form, often still, upon their broadest reasonable interpretation, claim another invention that is already patented, which is beyond the scope of their current invention. As hinted, the back and forth dialogue and amendments should be left to a patent attorney, as opposed to the inventor(s), because there is a level of art and science (e.g. in depth knowledge of the laws and the process) that distinguishes an effective prosecution of a patent application from an ineffective one. Ultimately, upon the patent application being placed in a condition that satisfies all conditions for patentability, a patent will be issued.

Once a patent is issued, the remaining process merely concerns the filing of maintenance fees that sustain the viability of the patent. See table 2 for the cost of maintenance fees (and see table 1 for the cost of all other fees associated with a patent's prosecution).[65] These fees do not factor in the costs of legal services that an inventor is always advised to seek when applying for a patent. As evident from table 1, the total cost of fees paid to the USPTO for a particular patent was $2,700.

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[64] 35 U.S.C. § 132.

[65] These are the fees charged to the Army's research organizations. The amount of the fee varies based on the size of the filing firm or entity.

Table 1. Patent Application Fees

| | |
|---|---|
| Filing Fee | $280 |
| Surcharge | $140 |
| Search Fee | $600 |
| Examination Fee | $720 |
| Issue Fee | $960 |
| **Total** | $2,700 |

*Source*: Created by author using data from the United States Patent and Trademark Office's Patent Application Information Retrieval for U.S. Patent 8,789,469 to Evangelisti et al., accessed May 6, 2016, http://portal.uspto.gov/pair/PublicPair.

Table 2. Patent Maintenance Fees

| | |
|---|---|
| 3.5 year maintenance fee | $1,600 |
| 7.5 year maintenance fee | $3,600 |
| 11.5 year maintenance fee | $7,400 |
| **Total** | $12,600 |

*Source*: Created by author using data from the United States Patent and Trademark Office's patent fee schedule, accessed May 6, 2016, http://www.uspto.gov/learning-and-resources/fees-and-payment/uspto-fee-schedule.

A resource that is as equally valuable as money is time. There are a couple points to make that involve patents and the spectrum of time. First, the patent issuance process, that is, the process from the date of application to issuance, is lengthy. This span of time is known as patent pendency. In March, 2016, the average patent pendency is 26.1 months.[66] Second, patents have an expiration date. They expire 20 years from the date of

[66] United States Patent and Trademark Office, "Data Visualization Center," accessed May 9, 2016, htttp://www.uspto.gov/dashboards/patents/main.dashxml.

filing.[67] There are mechanisms in place that compensate for a lengthy pendency, but generally, patents expire 20 years from the date of filing.

## The Army Process

There are two primary sources of material that purport to cover the current patent application process. The first is Army Regulation (AR) 27-60 *Intellectual Property* from 1993. The second is AR 672-20, *Incentive Awards*. First, AR 27-60 is explored. This AR applies to all Active Army and Department of the Army (DA) civilian employees.[68] It defines the Army entity that is responsible for prosecuting patent applications. This division is named the Intellectual Property Law Division.[69] One of the enumerated duties of this division is to "Prepare and prosecute applications for those Army activities not assigned patent attorneys or agents."[70]

This regulation prescribes two paths that are expected to be followed by inventors. The first path involves the submission of DA Form 4734-R, *Invention Disclosure*, directly to patent counsel.[71] The second path, involves the submission of DA Form 2871-R, *Invention Rights Questionnaire* through the chain of command.[72]

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[67] 35 U.S.C. § 154.

[68] Its application to the National Guard and Reserves is not clear.

[69] Headquarters, Department of the Army, Army Regulation (AR) 27-60, *Intellectual Property* (Washington, DC: Government Printing Office, 1 June 1993), 1.

[70] Ibid.

[71] Ibid., 2-3.

[72] Ibid., 4.

Chapter 2 deals specifically with patents. It has five sections. Section 1 introduces the concept of Soldier-inventors, although use of the title "Soldier" is not used. Instead, Soldiers are grouped into the tile of "government employees."[73] It notes that Soldiers may come up with an invention either through, or apart from, their military duties. In any event, Soldiers are advised to carefully document any efforts that relate to their innovative work. Section 1 also advises "research personnel"[74] to conduct prior art searches prior to initiating any research and development. Further, Section 1 cautions prospective inventors from disclosing details of their work as once such disclosure occurs, their innovation becomes more difficult to legally protect.[75]

Section 2 introduces the two paths discussed above. When read as a whole and with other provisions, these paths purport to be mutually exclusive of each other, but this is far from clear. First, DA Form 4734-R is *authorized* to be submitted directly to patent counsel.[76] The other form, DA Form 2871-R *must* be routed through the chain of command.[77] Upon receipt of DA Form 4734-R, patent counsel are advised to conduct a prior art search to assess whether the invention is patentable. Patent counsel are advised

[73] Department of the Army Regulation 27-60, *Intellectual Property,* 2.

[74] Department of the Army Regulation 27-60, *Intellectual Property,* 2. This is the only use of this phrase in AR 27-60. It is not clear what factors narrow government employees to research personnel.

[75] Ibid., 2.

[76] Table 12 in chapter 4 provides a summary of the Army's patent counsel that prosecuted patents issued during calendar years 2013 through 2015.

[77] Department of the Army Regulation 27-60, *Intellectual Property*, 4.

to communicate with the inventor(s) the results of their prior art search. DA Form 2871 is routed through the inventor's chain of command as discussed in great detail below.

Section 2 continues down the path involving the submission of DA Form 4734-R. As noted above, the filing of a patent is not free. As such, there are a couple of hurdles imposed by section 2 in order to justify the use of government funds to pay the fees for the prosecution of a patent application. The main hurdle is that it must be likely that an Army activity will use the invention, as evaluated by the Army activity, or the invention has commercial potential as judged by the Army activity. The next requirement is that the inventor execute an "unconditional license or assignment of the invention to the [Government]."[78] The inventor executes such on DA Form 2873-R. It is also contemplated in this section that the Government may prosecute patents even for inventions not made as part of a Soldier's official duties. Of course, the Soldier must assign the invention to the government in order for this to occur.

Section 2 next deals with maintenance fees. As mentioned above, the USPTO requires periodic fees in the years subsequent to the issuance of a patent. The Army will not pay these fees unless an Army activity expresses a "substantial interest"[79] in the invention and the Army activity demonstrates the viability of "clear commercial potential"[80] of the invention. An exception to this two-prong requirement exists if there is

[78] Ibid., 3.

[79] Ibid.

[80] Ibid.

"an overriding Government interest"[81] to pay the maintenance fees. Section 2 also requires the involvement of the Intellectual Property Counsel of the Army (IPCA)[82] when assessing whether to pay maintenance fees.

Section 3 shifts to issues surrounding the second path introduced above. This section sets forth the criteria for determining whether the government owns the rights to an invention or the Soldier owns the rights to an invention. The factors considered are whether the invention was made during working hours; was made in relation to the inventor's official duties; was made with the support of facilities, equipment, materials, funds, or information; or was made with the support of other Government duties on official duty.[83] In addition to the above non-exclusive factors, there is a presumption that the government owns the rights to an invention when the invention is made by an inventor, employed or assigned, to solve a problem.[84] Alternatively, for inventions that do not fall into this presumption of government ownership, it is equally presumed that the inventor owns the invention "subject to the reservation to the Government of a

[81] Ibid.

[82] Ibid. This official also serves as the Chief of the Intellectual Law Property Division within the Office of the Judge Advocate General. As such, any references to the latter position in AR 27-60, referred to in short form as JALS-IP, are referred to as the IPCA herein.

[83] Ibid., 3-4.

[84] It is interesting to note that, although this research does not concern processes, the presumption does not extend to problems solved that relate to a process.

nonexclusive, irrevocable, royalty-free license in the invention with power to grant licenses for all governmental purposes."[85]

Section 4 of Chapter 2 establishes the path that the submission of DA Form 2871-R must follow. This section also establishes the process that determines whether the government, or the inventor, owns the rights to the invention. The process begins with the inventor routing DA Form 2871-R through their supervisor for *any* invention made by the inventor, irrespective of whether or not the invention was made as part of the inventor's official duties. On this form, the inventor must determine whether they have a desire to retain rights to the invention. If there is no such desire, the process effectively ends with the inventor additionally completing DA Form 2874-R, *Assignment of Invention*. If there is such a desire the process continues with an initial evaluation by Army patent counsel as to the patentability of the invention. If Army patent counsel do not believe that the invention is patentable, then the process ends unless the inventor requests that a determination of rights to the invention be conducted.

In either event that the process does not end, per section 4, the previously completed DA Form 2871-R, as well as DA Form 2872-R, *Request for Determination of Invention Rights,* is routed from the patent counsel to the IPCA. Additionally, the duty military occupational skill of the inventor must be indicated in either of these two documents. Block 19 of DA Form 2871-R seems to be an appropriate place for the inventor's supervisor to document such information. Note that for inventions that the Army wishes to patent, patent counsel are directed to not begin drafting the application at

[85] Ibid., 4.

this point. The regulation then indicates that DA Form 2872-R is only needed for organizations that have patent counsel. The IPCA, upon receipt of DA Form 2872-R, decides whether the government owns the invention. This determination is captured on DA Form 2872-R.

Section 4 sets out three different determinations. First, the IPCA may determine that the government should own all rights to the invention. Second, the IPCA may determine that the inventor should own all rights to the invention subject to the government's reservation to license the invention. Third, the IPCA may determine that the inventor should own all rights to the invention. In the first and second cases, the inventor may appeal the determination.

Section 4 continues with the appellate process. The inventor may appeal the determination to the Under Secretary of Commerce for Technology (USCT). Two copies of the appeal must be filed with the USCT within 30 days of receiving the rights determination. The appeal should be routed directly to the USCT. The inventor may hire an attorney to assist with this appeal and may request oral arguments. The IPCA will receive one of the two copies filed with the USCT and respond to such with a detailed written response regarding the rights determination. This response must be submitted to the USCT and the inventor. There is no expressed suspense time for the response to be submitted. Upon receipt of the response, within 25 days, the inventor may file a reply to the USCT. The afore-mentioned deadlines may be extended so long as such extension is justified and submitted and approved by the USCT before said deadline expires. Subsequent to the USCT's decision, either party can request that the UCST reconsider the decision. This request for reconsideration must be filed within 30 days of the USCT's

decision. This request for reconsideration appears is the last avenue of appeal provided in this AR. The remaining part of the AR concern other forms of intellectual property, licensing, and contracting requirements. Additionally, the AR provides an overview of incentive awards, but such awards are covered in great detail in AR 672-20, *Incentive Awards*.

In AR 672-20, *Incentive Awards,* there are incentive awards specifically prescribed for an inventor's pursuit of a patent.[86] This regulation only applies to Active Army, Army Reserve, and to the cadets at the United States Military Academy. Specifically excluded from this regulation's application are members of the Army National Guard Soldiers and Technicians.[87]

Chapter 3 applies to inventions. There is an initial $200 award for the filing of a patent application. The regulation does not specify whether this amount is awarded to each inventor named on a patent application or whether it is to be shared among the inventors. A final award is also distributed in the amount of $500 with $250 per eligible co-inventor. Additional awards are also authorized that are based upon the invention's actual value. The IPCA is assigned the role of establishing eligibility procedures as well as the processing of these awards. It is interesting to observe that outside of the patent application award, the latter two awards are not expressly tied to a patent; rather they are tied to an invention.

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[86] *See* Headquarters, Department of the Army, Army Regulation (AR) 672-20, *Incentive Awards* (Washington, DC: Government Printing Office, 1 April 2014).

[87] Ibid., i. Unlike AR 27-60, which does not mention the applicability to the Reserves or the National Guard, as discussed above, this AR expressly excludes these organizations.

Chapter 4 provides details of the Special Act or Service Award that may be awarded to Soldiers for significant technical contributions to the military. These contributions range from scholarship to actions that enable future technical improvements. This award is a cash award that may range from $25 to $25,000. There are tables in chapter 7 of AR 672-20 that establish the monetary value of an award based on its underlying achievement's financial impact. For example, for an award that yields a $100,000 tangible benefit to the Army, there is a corresponding award of $3,700 to its proponent.[88]

In summary, AR 27-60 purports to describe two mutually exclusive paths of submitting documents related to a Soldier's invention. The paths are purported to be mutually exclusive because they are each authorized to be submitted to different officials; one is authorized to be submitted directly to patent counsel while the other is mandated to be submitted through the inventor's chain of command. However, they are inextricably linked together in terms of substance. AR 672-20 compliments AR 27-60 by providing details as to incentives that Soldier-inventors may receive for their patentable innovations.

## The Army and Innovation

Most military efforts, directly or indirectly, have roots that reside with the Commander-in-Chief. Innovation efforts are no different. President Obama recently declared innovation as the "hallmark of the United States[.]"[89] It is "our big comparative

[88] Ibid., 11.

[89] Julie Hirschfield Davis, "Obama Pushes for Better Cheaper Choices in Cable Boxes," *New York Times*, April 15, 2016, accessed April 30, 2016, https://www.

advantage with other countries."[90] In order to maintain this advantage, the President believes it is important to tap into the "full potential of every American."[91] That is, innovation should not be merely be left to America's scientists, engineers, and corporations. Toward this end, the President hosted the first ever White House Demo Day in 2015.[92] This event aimed to connect entrepreneurs with fellow innovators, mentors, and organizations. The intent was to network Demo Day beyond the walls of the White House, through cyberspace, and into dorm rooms, garages, and universities.

Beyond the White House, the various national and defense strategy planning documents funnel the President's innovation desires into the military. The 2014 Quarterly Defense Review is particularly instructive as to innovation. [93] The Secretary of Defense places innovation at the "center stage as [the military] adapts to meet future

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bostonglobe.com/business/2016/04/15/president-obama-urges-fcc-open-cable-box-you-can-watch-how-you-really want/BbLDgRO2epYut0Vw1DfRyL/story.html.

[90] Ibid.

[91] White House Live, Twitter post, August 4, 2011, accessed December 23, 2015, http://twitter.com/WHLive.

[92] The White House, "White House Demo Day," accessed April 30, 2016, https://www.whitehouse.gov/demo-day.

[93] Department of Defense, *Quadrennial Defense Review*, accessed April 30, 2016, http://www.defense.gov/News/Special-Reports/QDR. "The [Quarterly Defense Review] is a legislatively-mandated review of DoD strategy and priorities. The Quarterly Defense Review will set a long-term course for DOD as it assesses the threats and challenges that the nation faces and re-balances DOD's strategies, capabilities, and forces to address today's conflicts and tomorrow's threats." Interestingly, the word innovate or innovation is mentioned nearly as many times in the 88 page document as war and warfare.

challenges."[94] Innovation is the "central line of effort" in "finding creative, effective, and efficient ways to achieve [U.S.] goals and assist in making strategic choices."[95] Within this line of effort, the Quarterly Defense Review identifies the importance of partnerships and "incremental undertakings"[96] to reach the end state of the Department of Defense (DoD) infused with a culture of innovation. Also within this line of effort is the goal to incentivize innovation with an understanding that resources are declining, but the military's goals remain the same thereby compounding the necessity for effective innovation.[97] There is no quick and easy solution to reaching the innovation end state. However, the Chairman-author urges action with the concern that "[the U.S.] will not innovate quickly enough."[98] In addition to the Quarterly Defense Review, the National Security Strategy and the National Military Strategy reinforce the above efforts toward prioritizing innovation with equal magnitude. In summary, there is a solid foundation of Presidential charges and strategy-planning guidance for any of the services to build their houses of innovation upon.

The Army in turn, receives the baton of innovation from the DoD guidance and advances it to its Soldiers. Army doctrine identifies innovation as one of the eight tenets

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[94] Department of Defense, *Quadrennial Defense Review 2014* (Washington, DC: Government Printing Office, 2014), accessed April 30, 2016, http://www.defense.gov/Portals/1/features/defenseReviews/QDR/2014_Quadrennial_Defense_Review.pdf.

[95]Ibid., 12.

[96]Ibid.,, 44.

[97] Ibid., 68, 81.

[98] Ibid., 86.

that guide the generation and application of combat power. It is one of the tenets commanders employ to "align efforts in time, space, and purpose to achieve campaign objectives."[99] A former Army Chief of Staff proclaimed that innovation is critical; it is "need[ed] to ensure that [the Army's] Soldiers, leaders, and teams are prepared to win in a complex world."[100]

Innovation is not something that happens by chance. It is the product of an organization's culture. An analysis of the Army's organizational culture is enabled through the review of the components that make up an organization's culture. Additionally, it is helpful to review the hallmarks of an innovative culture and some of the growing pains that are associated with such along with an overview of the Army's culture with a focus on innovative thinking.

## Culture Defined

Organizational culture expert Edgar Schein provides the launching pad to enable an analysis of the critical enablers and disablers of the Army's innovative culture.[101] Schein's book "Organizational Culture and Leadership"[102] is a comprehensive and systematic analysis of organizational culture. He provides four main areas of focus in his

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[99] Training and Doctrine Command Pamphlet 525-3-1, 20.

[100] Ibid., 3.

[101] Massachusetts Institute of Technology, Sloan School of Management, "Faculty and Research," accessed March 26, 2016, http://mitsloan.mit.edu/faculty-and-research/faculty-directory/detail/?id=41040. Schein is Professor Emeritus at the Massachusetts Institute of Technology's Sloan School of Management.

[102] Edgar Schein, *Organizational Culture and Leadership*, 4th ed. (New York: Jossey Bass, 2010).

work. First, Schein defines organizational culture by dividing it into three elements. Second, he describes the characteristics and mannerisms of organizational culture; i.e. what makes one culture different from another. Third, he offers ways that culture can be changed. The second and third areas of focus feature some overlap. A review of the characteristics of a culture inherently suggests ways that a culture can be changed. For example, a culture's reward system may characterize a culture, but it also suggests how it can be changed. Albeit, changing a reward system probably does not provide the enduring cultural change that Schein seeks. Fourth, he provides an assessment of various organizational cultures, some much more in depth than others. Particularly helpful to this research, he assesses the culture of the U.S. Army Corps of Engineers (USACE). These four areas provide a framework that enables an analysis of the Army's culture of innovation.

*Culture and Leadership* is well organized. There are five parts that closely align with the four areas of focus described above. Schein helpfully closes each chapter with a summary section containing several conclusions. In many chapters, he previews concepts that lie ahead which aids in distinguishing certain concepts while also linking some of them together.

Schein defines organizational culture by describing its three elements, or "levels."[103] Before exploring these elements, organizational culture, in short, is defined as

[103] Schein, 23.

the personality and character of a group of individuals united for a common purpose.[104] An organization's culture helps describe why it does what it does.

The first level of an organization's culture is the organization's observable characteristics; its "artifacts."[105] These are the characteristics that are easy to discern upon observing an organization. For example, if one visits a military unit and notes everything that appears through sights and sounds, these are the unit's artifacts. The artifacts surface through inspecting a unit's facilities, the appearance of its Soldiers, and simply watching how the unit processes instruction.

The second level of an organization's culture is the organization's "espoused beliefs and values."[106] These are the organization's mottos, values, and creeds. Whether they are actually pursued and adhered to is not entirely relevant. They are the beliefs that the unit purports to aspire to. In a military unit, they represent the chants a unit exults upon being brought to attention. They are the slogans that appear on the walls or archways of an organization. Note that there is some overlap between this second level and the first; mottos and chants are obviously observable. However, they exist primarily for the purpose of driving an organization's attitude.

The third level is the organization's "basic underlying assumptions."[107] This level of organizational culture is by far the toughest to discern. It describes the essence of why

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[104] Ibid., 14.

[105] Ibid., 24.

[106] Ibid.

[107] Ibid.

an organization does what it does. It may subconsciously drive an organization's performance. The questioning of the assumptions "release[s] anxiety and defensiveness"[108] of those within the organization. As an example, Schein describes an experience of consulting an organization through distributing memorandums with advice on how to better reach its goals. The memos were not disseminated because one of the organization's underlying assumptions is that "unsolicited ideas [are] generally not well received."[109] These assumptions can be spotted as the causes of an outside observer's perplexity or confusion. The outside observer, without further inquiry, cannot explain why something happens or does not happen upon observing an organization. As noted, even with the further inquiry, a rational explanation may still not surface. It is often through a review of the mannerisms and characteristics as a whole, that some of the underlying assumptions can be understood.

The mannerisms and characteristics, or "dimensions,"[110] of culture are what sets one culture apart from another. These dimensions can be categorized as any one of the three levels of culture described above. Table 3 provides an example of some of the dimensions of culture that Schein describes. This table obviously is not all encompassing; Schein provides a litany of dimensions in chapter 10 of his book. As Schein notes, an all-

[108] Ibid., 29.

[109] Ibid., 49.

[110] Ibid., 69.

encompassing description of a culture is not possible; rather a focus should be placed on some of its "key phenomena"[111] relevant to an issue encountered by an organization.[112]

Table 3. Dimensions of Culture

| |
|---|
| Rewards and punishment system |
| Myths and stories |
| Languages and jargon |
| Areas of emphasis and interest |
| Basic unit of performance |
| Power distance between leaders and subordinates |
| Ways of reaching truth |
| Individualistic vs. Collectivist |
| Focus in Time |
| Linear or non-linear performance of tasks |
| Extent of operational autonomy |
| Tolerance of complexity |
| Planning horizons |

*Source*: Created by author using data from Edgar Schein, *Organizational Culture and Leadership*, 4th ed. (New York: Jossey Bass, 2010).

Schein's third area of focus centers on a roadmap to follow for changing an organization's culture. He identifies three stages for changing an organization's culture. First, and the one that bears the most discussion, is the stage of unfreezing. One can think of culture as a frozen block of ice and the ease of unfreezing the top layer. This can be analogized with change at the artifact level. However, with just the top layer thawed, the

[111] Ibid., 35.

[112] Ibid., 316.

block retains its general shape; or the organization retains its general cultural identity. It is only with a complete unfreezing of the entire block of ice that cultural change can be achieved.

Schein incorporates three necessary pre-requisites for a complete thaw. First, there must be reason to change. This reason can exist in the form of facts or assessments that reveal that something is wrong. This disconcerting information, or "disconfirmation"[113] as Schein calls it, must then be linked to important goals of the organization. This linkage should be strong enough, either in terms of the importance of the goal or the gravity of disconcertment, that anxiety or guilt surfaces. Next, there must be a greener grass, or a safety net, to advance toward. Schein labels the greener grass as "psychological safety."[114] This is a logical progression of the first step of changing an organization's culture: something is wrong; it is important; and there is a solution.

The second and third stages of cultural change concern what to do once the old culture is thawed. These stages deal with more specific solutions with perhaps a model organization to admire or a revision of goals along with recognition that there will be some growing pains now that the boundaries of the frozen block of ice no longer exist. Essentially, these stages result in an effective re-freeze, however, in a different shape than before. Necessary to this refreezing is that the new dimensions align with the various levels of the organization's culture.

[113] Ibid., 300.

[114] Ibid., 302.

The fourth and last area of focus of *Culture and Leadership,* relevant to this research, provides examples of cultural assessments of various organizations. He provides ten steps to assess a culture. This assessment requires a group of people that represent the assessed organization. Steps one through five involve obtaining leadership buy-in, selecting the group, and briefly educating the group about the components of a culture. Schein in steps six through eight recommends spending two hours soliciting the group's feedback on what constitutes the three levels of their organization's culture.[115] Interestingly, he advises spending an hour on artifacts and thirty minutes apiece on the other two levels. Step 9 hones in on the issue encountered by the organization. The group suggests issues that "aid or hinder"[116] a shift in their organization's culture pursuant to the problem encountered by it. Step 10, the final step of the assessment, narrows the scope on fundamental assumptions that are difficult to co-exist with a solution to the organization's encountered problem. A line of effort is discussed to manage the culture moving forward along with objectives and tasks that may parallel changing some of the cultural dimensions shown in table 3.

Specific to this research paper, Schein provides a brief assessment of USACE.[117] The ten steps mentioned above were followed with a group of twenty-five civilian and

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[115] Ibid., 319. Each level garners its own step; e.g. step six analyzes what constitutes an organization's artifacts.

[116] Ibid., 323.

[117] Ibid., 334. This assessment was done in 1986 with a group of 25 USACE civilian and military managers. The purpose of the assessment was to analyze their culture to "(1) remain adaptive in a rapidly changing environment, (2) conserve those elements of the culture that are a source of strength and pride, and (3) manage the evolution of the organization realistically."

military managers. The assessment was prompted by perceived changes to their organization's mission as well as uncertainties regarding funding. Table 4 lists the unearthed themes of USACE in terms of the organization's values and assumptions.

Table 4. USACE values and assumptions

| |
|---|
| Our mission is to solve problems of river control, dams, bridges, and so forth pragmatically, not aesthetically, but our responsiveness to our environment leads to aesthetic concerns within the context of any given project. |
| We always respond to crisis and are organized to do so |
| We are conservative and protect our turf but value some adventurism |
| We are decentralized and expect decisions to be mad in the field but control the field tightly through the role of the district engineer. |
| We are numbers driven and always operate in terms of cost/benefits analyses, partly because quality is hard to measure. |
| We minimize risk because we must not fail; hence things are over-designed, and we use only safe, well-established technologies. |
| We exercise professional integrity and say no when we should. |
| We try to minimize public criticism. |
| We are responsive to externalities but attempt to maintain our independence and professional integrity. |
| We are often an instrument of foreign policy through our non-U.S. projects. |

*Source*: Created by author using information from Edgar Schein, *Organizational Culture and Leadership*, 4th ed. (New York: Jossey Bass, 2010). 334-335.

In summary, *Culture and Leadership* is a comprehensive work by a renowned organizational culture expert that is easy to follow and comprises many examples that apply the cultural concepts described therein. The author provides a useful definition for the abstract concept of organizational culture, describes an organizational culture's components, and offers a roadmap to change and assess an organization's culture. Lastly, Schein provides examples of cultural assessments within various organizations such as USACE, which can serve as a narrow cultural assessment of the Army as a whole. Before

literature of the Army's culture is reviewed, literature associated with innovative cultures in general is reviewed.

Renowned author Walter Isaacson authored several books regarding innovation. These works include the biographies of American innovating giants such as Benjamin Franklin and Steve Jobs. [118] Both of these giants knew no limits to their capacity to innovate. Franklin's innovations include fireplaces, flexible catheters along with developing various properties of electricity.[119] Electricity powered the world of another innovative giant biographed by Isaacson, Steve Jobs. In addition to his biography of Jobs, and highly applicable for this research, Isaacson studied the common themes of an innovative culture that fueled the digital revolution that Jobs was such an integral part of.

The development of the digital revolution involved the collaboration of engineers, businessmen, introverts, extroverts, and the military, among others. Further, this development spanned a significant portion of the past century. As such, the culture that fostered the digital revolution is worth review to identify what makes innovation work.

In *The Innovators: How a Group of Inventors, Hackers, Geniuses, and Geeks Created the Digital Revolution,* Isaacon offers countless suggestions for fostering, breeding and sustaining an innovative culture. Isaacson does this through studying the

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[118] Walter Isaacson, *Benjamin Franklin* (New York: Simon and Schuster, 2003), 132. Franklin, though a prolific inventor, passed on the opportunity to profit off of his patents so he declined patent protection. As Isaacson notes in Benjamin Franklin, Franklin mentions in his autobiography that "As we enjoy great advantages from the inventions of others, we should be glad of an opportunity to serve others by an invention of ours, and this we should do freely and generously." Isaacson remarks that this was a "noble and sincere sentiment" of Franklin's.

[119] Isaacson, *Franklin*, 129-145.

development of the components of the digital revolution; namely, the computer, programming, the transistor, the microchip, video games, the internet, the personal computer, and software. Isaacon notes some core, foundational concepts to cultures that breed innovation.[120] First, is an ability to connect the sciences with the arts. One of Steve Jobs' heroes, once noted the importance of people that can "stand at the intersection of humanities and sciences, and I decided that's what I wanted to do."[121] Isaacson notes that the people who stood at this intersection sparked and sustained the digital revolution.

Each of the components of the digital revolution generally built upon the other; e.g. the personal computer would not exist, but for the original computer along with the microchip. The birth of the computer is widely attributed not to Microsoft or Apple, but to the Army. The Electronic Numerical Integrator and Computer, at 100 feet long, eight feet high, and 30 tons was the first general purpose computer; i.e. it was capable of performing more than one task. Specifically, this computer, fully operational a few months after the deployment of the first atomic bomb, operated to calculate artillery trajectories as factored by the wind, humidity, and other elements.

The main lesson of the development of the computer forms Isaacson's second core, foundational concept that breeds innovation: collaboration. The components of collaboration are clear: a creative idea, the scientists to refine the ideas, along with a

[120] Isaacson, *The Innovators.*, 188-189. To be clear, the innovation that most of the book refers to is the development of products and devices; as opposed to, for example, the improvement of services.

[121] Ibid., 5.

business acumen to market the product.[122] Isaacson references early conceptions of the computer born by lone inventors that failed to connect with other scientists as a prime example of the dangers of omitting a single element.

In support of the two core concepts: first, connecting art with science and second, collaboration, are several other key concepts that foster a culture of innovation. First, advancing ideas through a chain of command, and bureaucracy, stifles innovation. The so-called "Mayor of Silicon Valley," Robert Noyce, detested chain of commands common to east coast corporate America. He likened the advance of ideas through these chains of command as navigating through "a corporate court and aristocracy."[123] Noyce preferred the direct connection between the people generating the ideas and the scientists; not an intermediary corporate court. However, those generating the ideas were cautioned to be prepared before engaging those stressed for time and resources. The scientists provided mentorship, not answers to those with ideas that were seeking the scientists input. An insightful exchange was noted: "You've got to consider A, you've got to consider B, and you've got to consider C…But if you think I'm going to make your decision for you, you're mistaken."[124]

Another key concept is that of simplicity. Isaacson cites the development of Atari's *Pong* as a product of simplicity juxtaposed to a product of complexity: *Computer Space*. In brief, *Computer Space* had a series of complex instruction that a user must

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[122] Ibid., 210. "Innovation can be sparked by engineering talent, but it must be combined with business skills to set the world afire."

[123] Ibid., 193.

[124] Ibid.

review in order to understand how to play the game. *Pong* on the other hand was so simple to play that even a "beer-sloshed barfly or stoned sophomore"[125] could play the game. *Pong* featured a single instruction: "Avoid missing the ball for a high score."[126]

Isaacson did not merely recite core principles that foster an innovative culture. Rather, he provided concrete examples of organizations that had the culture, and organizations that lacked the culture. Those that had it, succeeded; those that did not, failed. In summary, Isaacson presents an introduction to the components of an innovative culture in general. It is now helpful to zoom in to the components of the military's culture and how they enable, or disable, innovation.

## The Army's Culture

Three works are selected to anchor an analysis of the Army's culture. First, Dr. James G. Pierce, a retired Army Colonel and Director of Publications, Strategic Studies Institute at the U.S. Army War College, authored a monograph listing numerous dimensions of the Army's culture.[127] These dimensions are listed in table 5. Pierce identified these dimensions to determine the congruence of these dimensions with those required for the professional development of its senior officer corps. The Army officers that identified the dimensions in table 5 also identified *preferred* dimensions within the

[125] Ibid., 212.

[126] Ibid.

[127] James G. Pierce, "Is the Organizational Culture of the U.S. Army Congruent with the Professional Development of its Senior Level Officer Corps?" (Letort Papers, Strategic Studies Institute, Carlisle, PA, September 2010), accessed April 12, 2016, http://www.strategicstudiesinstitute. army.mil/pubs/display.cfm?pubID=1015.

Army's culture, though not necessarily present. These dimensions are also listed in table 5.

Table 5. Current and Preferred Cultural Dimensions of the U.S. Army

| **Current** |
|---|
| An overarching desire for stability and control |
| Formal rules and policies |
| Coordination and efficiency |
| Goal and results oriented |
| Hard-driving competitiveness |
| **Preferred** |
| Flexibility and discretion |
| Participation |
| Human resource development |
| Innovation and creativity |
| Risk-taking |
| Long-term emphasis on professional growth |
| Acquisition of new professional knowledge and skills |

*Source*: Created by author using information from James G. Pierce, "Is the Organizational Culture of the U.S. Army Congruent with the Professional Development of its Senior Level Officer Corps?" (Letort Papers, Strategic Studies Institute, Carlisle, PA, September 2010), 101, accessed April 12, 2016, http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=1015. Note: The data set for this survey included 533 Army officers.

The author asserts that "the Army's culture is preventing the individual exercise of the excellent professional skills that are being taught via the Army's formal professional development programs."[128] Pierce cites research as supporting his positions above, that the Army "more reflexively rewards stability and control and encourages excessively structured supervision by severely punishing innovation and risk-taking that

[128] Ibid., 106.

results in failure."[129] It should be noted that this 2010 monograph is based off of data solicited in 2003 from nearly 1,000 officers enrolled in the U.S. Army War College. Further, the collection of data precedes the introduction of the Army's mission command philosophy published in 2012.

Two graphics capture the essence of Pierce's study in greater detail than described above. First, table 6 defines the quadrants that the author uses to graphically depict the current and preferred cultural dimensions of the Army. Second, figure 4 shows the current cultural dimensions depicted in the solid-lined polygon while the preferred cultural dimensions are depicted with the dash-lined polygon. As the author notes, the dominant set of cultural dimensions in the current assessment lies in the hierarchy cultures and the market cultures; both lending to greater stability and control. The author observes that the preferred cultural dimensions are "strongly supportive of flexibility and discretion and can be characterized by a concern for people and teamwork, as well as a strong interest in innovation, initiative, creativity, and a long-term emphasis on growth and the acquisition of new resources."[130]

[129] Ibid., 104.

[130] Ibid., 91.

Table 6. Four Cultures Defined

| | |
|---|---|
| **The Clan Culture.**<br>A very friendly place to work where people share a lot of themselves. It is like an extended family. The leaders, or the heads of the organization, are considered to be mentors and perhaps even parent figures. The organization is held together by loyalty or tradition. Commitment is high. The organization emphasizes the long-term benefit of human resources development and attaches great importance to cohesion and morale. Success is defined in terms of sensitivity to customers and concern for people. The organization places a premium on teamwork, participation, and consensus. | **The Adhocracy Culture.**<br>A dynamic, entrepreneurial, and creative place to work. People stick their necks out and take risks. The leaders are considered innovators and risk takers. The glue that holds the organizations together is commitment to experimention and innovation. The emphasis is on being on the leading edge. The organization's long-term emphasis is on growth and acquiring new resources. Success means gaining unique and new products or services. Being a product or service leader is important. The organization encourages individual initiative and freedom. |
| **The Hierarchy Culture.**<br>A very formalized and structured place to work. Procedures govern what people do. The leaders pride themselves on being good coordinators and organizers who are efficiency-minded. Maintaining a smooth-running organization is most critical. Formal rules and policies hold the organization together. The long-term concern is on stability and performance with efficient, smooth operations. Success is defined in terms of dependable delivery, smooth scheduling, and low cost. The management of employees is concerned with secure employment and predictability. | **The Market Culture.**<br>A results-oriented organization whose major concern is with getting the job done. People are competitive and goal-oriented. The leaders are hard drivers, producers, and competitors. They are tough and demanding. The glue that holds the organization together is an emphasis on winning. Reputation and success are common concerns. The long-term focus is on competitive actions and achievement of measurable goals and targets. Success is defined in terms of market share and penetration. Competitive pricing and market leadership are important. The organization style is hard-driving competitiveness. |

*Source:* James G. Pierce, "Is the Organizational Culture of the U.S. Army Congruent with the Professional Development of its Senior Level Officer Corps?" (Letort Papers, Strategic Studies Institute, Carlisle, PA, September 2010), 54.

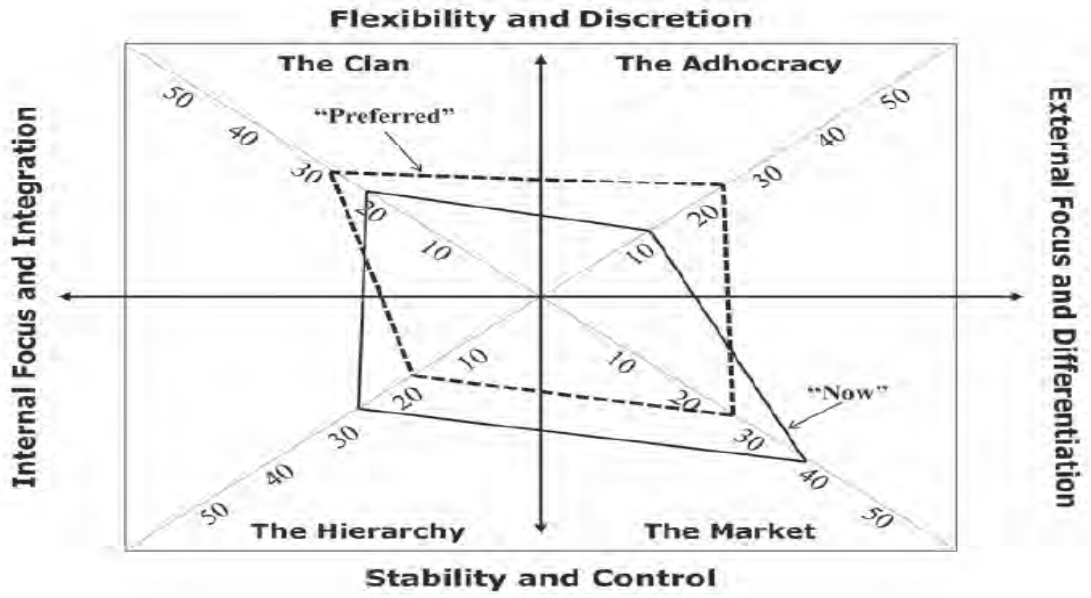


Figure 4. Current and Preferred Cultural Dimensions of the U.S. Army

*Source*: James G. Pierce, "Is the Organizational Culture of the U.S. Army Congruent with the Professional Development of its Senior Level Officer Corps?" (Letort Papers, Strategic Studies Institute, Carlisle, PA, September 2010), 88.

Pierce's study is comprehensive and thus provides a keen insight into the Army's cultural dimensions. As already hinted, the study has its flaws; it is based off of data that is well over a decade old and it solicits data only from officers as opposed to a mix of officers and enlisted Soldiers. On the other hand, thirteen years is not a long time in the multiple century age of the Army; moreover, though the data is solicited from officers, it can be assumed that these senior field grade officers represented views of enlisted Soldiers familiar to them.

*Military Innovation and Military Culture* puts any advocate for military innovation on notice of the inevitable gear noise of meshing innovation's pinon gear with

the military's gears.[131] It is a quick and concise read that captures many issues relevant to this research. It reinforces the value of anchoring an analysis of a military culture around. Schein's definition and the dimensions of an organizational culture.[132] It also reinforces Dr. Schein's first step of initiating cultural change through a similar triad of actions: identify, demonstrate, and persuade. This triad is "the core to innovation leadership."[133] The author's goal however, is not to stifle innovation, or just point out its complexities. It is to set any innovation advocate up for success.

The author notes that the key to successful innovation is a proper alignment of the military gears, in the form of its cultural dimensions, with the driving pinion gear of innovation. A failure to appreciate the military dimensions, particularly those that, at first glance, obstruct innovation, creates an annoying gear noise that ultimately results in the destruction of the gear of innovation. An understanding of the military's cultural dimensions requires an understanding of the "conservative culture hypothesis."[134] The author asserts that this hypothesis stifles innovation.[135] Table 7 lists many cultural

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[131] Andrew Hill, "Military Innovation and Military Culture," *Parameters* 45, no. 1 (Spring 2015), accessed April 20, 2016, http://www.strategicstudiesinstitute.army.mil/pubs/Parameters/Issues/Spring_2015/10_HillAndrew_Military%20Innovation%20and%20Military%20Culture.pdf.

[132] Hill, "Military Innovation," 86. Specifically, the author references Schein's "compelling" definition as having "great significance for understanding innovation."

[133] Ibid., 95.

[134] Ibid., 87

[135] Ibid., 88.

dimensions of this hypothesis along with other dimensions that the author identifies as applying to the military in general.

Table 7. Military Cultural Dimensions and their Detriment to Innovation

| Dimension | Detriment to Innovation |
|---|---|
| A benefit for the group outweighs a benefit for the individual | Individual ideas that diverge from the norm are discouraged |
| Order, obedience, and hierarchy are emphasized | Ideas may never be generated due to robotic deference. |
| Uniformity is preferred | Sampling innovations is ineffective and inefficient. In other words, a Soldier is not going to want to carry two kinds of ammo for the purposes of testing out a secondary weapon.[136] |
| Military organizations are constantly reinforcing their ties to the past | Do not try and introduce something new into a proven organization; also principles of courage and "honorable warfare" demand the context of a given period of time.[137] |
| Ceremony and tradition is valued | Non-conformity results in disjointed ceremonial functions (e.g. the Soldier that executes a right face when all others execute a left face) |
| Military values past experiences | If it worked in the past, why change it? |
| Deference to authority | Creativity and ideas are restrained; |
| The less options the better as long as they accomplish the mission. | Do not overthink things; if accomplishing A,B, and C meets the mission, then just do that. Do not worry about accomplishing D, E, and F (at least only until accomplishing A, B, and C).[138] |

[136] Ibid., 93. The author illustrates this with a historical account of General James Ripley during the American Civil War.

[137] The author observes that innovation directly impacts what one generation perceives to be courage and "honorable warfare" relative to the next. The opening epigraph to this chapter hints at this dimension of the military's culture.

[138] Lieutenant General Robert Brown, "Advice to Field Grade Officers" (speech to the Command and General Staff College, Fort Leavenworth, April 29, 2016). Lieutenant General Brown assisted with this wherein he expressed his bewilderment at how all too frequently he encountered leaders worrying about accomplishing D, E, and F (each letter representative of a task) when their mission was to merely complete A, B, and C. More particularly he was bewildered at the choice of leaders to execute D, E, and F *before* executing A, B, and C. He advised the soon to be graduating class of the Command and General Staff College to *always* execute A, B, and C before D, E, and F. He noted that this mindset is highly effective and, for him, frequently enables the completion of not only D, E, and F, but also G, H, and I.

| | |
|---|---|
| The more precise the weapon, the better; the less precise, the worse.[139] | The stages of innovation are not always linear. In other words, new technologies may undergo a period of imperfection.[140] This dimension often discourages innovation that is initially imperfect, but has the potential to invaluably aid military forces. |

*Source*: Created by author with information from Andrew Hill, "Military Innovation and Military Culture," *Parameters* 45, no. 1 (Spring 2015), accessed April 20, 2016, http://www.strategicstudiesinstitute.army.mil/pubs/Parameters/Issues/Spring_2015/10_HillAndrew_Military%20Innovation%20and%20Military%20Culture.pdf.

The author labels many of these as "classic military virtues"[141] on the one hand and "liabilities when the organization is seeking change"[142] on the other. A key to successful innovation is exploiting dimensions that can enable innovation, despite the perception that those same perceptions stifle it.[143] Dr. Hill labels this as "engineer[ing] the competitive context for innovation."[144] This is what is meant by aligning the innovation with the military's cultural dimensions. See table 8 for a different perception of the same dimensions; in other words, the author carefully notes that innovation is not necessarily "a rejection of the enduring values of the organization."[145]

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[139] Hill, "Military Innovation," 90-91. The author used this dimension in the context of collateral damage; inadvertent damage should be minimalized to the greatest effect.

[140] Ibid. The author enables a linkage with the excavator story from chapter 1.

[141] Ibid., 87.

[142] Ibid.

[143] Ibid., 96

[144] Ibid.

[145] Ibid., 94.

Table 8. Military Cultural Dimensions and their Benefits to Innovation

| Dimension | Benefit to Innovation |
|---|---|
| A benefit for the group outweighs a benefit for the individual | Focuses and channels the persuasion to innovate on a group versus several unique individuals with different interests. Successful persuasion of a group increases the chances of organizational buy-in |
| Order, obedience, and hierarchy are emphasized | If a certain innovative process can be institutionalized, wide and mass adherence to such innovation is facilitated |
| Uniformity is preferred | Also means problems are uniform which may attract different operational approaches to solving them. In other words, the more Soldiers that experience a problem, the greater the chance for finding an effective solution. |
| Military values past experiences | Provides opportunities to re-visit prior experiences for needed solutions |
| Ceremony and tradition is valued | Stories of successful innovation provide opportunities to inspire. |
| "Military is hyper-attentive to what has worked in the past" | The after action review is deeply institutionalized; this is a golden opportunity to identify specific problems awaiting solutions |
| Deference to authority | An emphasis on innovation can be powerful |
| The less options the better as long as they accomplish the mission. | Funnels innovative efforts to a particular problem thereby reducing wasted efforts and resources such as multiple organizations simultaneously pursuing similar solutions to the same problem. |
| The more precise the weapon, the better; the less precise the weapon, the worse.[146] | Demands more effective solutions at the outset. |

*Source*: Created by author with information from Andrew Hill, "Military Innovation and Military Culture," *Parameters* 45, no. 1 (Spring 2015), accessed April 20, 2016, http://www.strategicstudiesinstitute.army.mil/pubs/Parameters/Issues/Spring_2015/10_HillAndrew_Military%20Innovation%20and%20Military%20Culture.pdf.

The author makes several interesting assertions but omits context or evidentiary support for some of them. As an example, the author asserts that unplanned military innovation is strongly discouraged in peace merely because the military is a public and authoritative organization. The author does not provide any immediate support leading a reader to believe that this assertion is axiomatic. However, literature such as *Military*

[146] Ibid., 90-91.

*Innovation in the Interwar Period*, clearly suggests this is not the case.[147] As discussed in the below review of this literature, unplanned military innovation overflowed in peace. Perhaps Dr. Hill is getting to a point recently made by innovation-strategist Pierre Chao in an interview with Army AL&T magazine. Chao observes that perhaps it is the taxpayer's unwillingness to accept failure that is the root of the military's struggle with accepting prudent risk and failure.[148] In summary, Hill's article is a needed and candid assessment of many of the military's cultural dimensions as they apply to innovation that is embedded with thought provoking assertions.

*Military Innovation in the Interwar Period* is a collection of ten essays that explore the introduction of major combat capabilities, from the tank to radar, from the perspective of the world's military powers. As the title indicates, the time span for this exploration is generally limited to the decades of the 1920s and 1930s, though recent conflicts, relative to the work's publication date, are briefly acknowledged as well. The first six essays of *Interwar* provide an in-depth look at the evolution of armored warfare, amphibious warfare, strategic bombing, close air support, and the application of the aircraft carrier and the submarine. It is the last four essays that provide more general observations of innovation that are of most interest to this review.

First, author Dr. Alan Beyerchen reviews the development of radar within the British, German, and U.S. industries and militaries. Beyerchen examined the reasons

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[147] Williamson Murray and Allan Millett, eds., *Military Innovation in the Interwar Period* (Cambridge, UK: Cambridge University Press, 1996). This collection of essays is mandatory reading for all CGSC students in the H200 block of instruction.

[148] Chao, 111.

why, although each of the powers' industries developed radar on a "roughly parallel"[149] track, the British dominated its development.[150] The author suggests that the Germans were too complacent with its development, since they were the force that created its need through the overwhelming dominance of their U-boats.[151] Conversely, the U.S. procrastinated their development because there was not a perceived need to do so due to their "grand strategic indifference"[152] until around 1940. Nevertheless, a sense of urgency eventually brought the U.S. military's appreciation for radar on line with its technological development. Further, collaboration between the militaries and the scientists and engineers was essential to its development. The collaboration sparked insights and solutions perhaps ahead of schedule due to this collaboration between those in the field and those in the labs. Additionally, the author provides a framework to help contextualize innovation as it applies to equipment and weaponry. Table 9 lists this framework.

[149] Beyerchen, 298.

[150] Ibid., 265. Interestingly, in 1904, a young German, Christian Hulsmeyer patented a device that "transmit[s] radio waves and receives their reflections off a passing object." However, at the time, there was not a perceived need for this technology nor were there research and development budgets overflowing with funds that enabled the further development of this technology.

[151] Radar development was stimulated largely to counter the U-boat threat.

[152] Ibid., 269.

Table 9. Framework for Defining Innovation

| | | |
|---|---|---|
| Context | Technological change | Strategy |
| Procedures | Operational change | Operations |
| Equipment | Technical change | Tactics |

*Source:* Alan Beyerchen, "From Radio to Radar," in *Military Innovation in the Interwar Period,* eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996), 268.

These concepts are useful to compartmentalize different types of innovation, or change, as worded by the author. An improvement in a particular device falls in the bottom row: technical change. As an example, the use of radar to detect an object at a greater distance is a technical change. It is worth noting that technical change is really the level of change at the heart of this research. The way that the technical change is applied in the military is described as operational change. As an example, the mere application of radar on the seas or in the air is an operational change from one application to another. In other words, this level is the functional use of the technical change. Technological change is how a certain technology and its functional use alters a power's strategy. As the author notes, there is some overlap between the categories. The difference between the levels may be blurry, but the framework is helpful for classifying different types of innovation.

In *Innovation: Past and Future,* Williamson Murray provides insight into a valuable component of any military organization's genuine desire to innovate.[153] This component is that of a well-defined problem. Murray notes that in "virtually every

[153] Williamson Murray, "Innovation: Past and Future," in *Military Innovation in the Interwar Period,* eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996).

case"[154] of successful innovation was an underlying specific problem. He identifies several options for unearthing problems.

For one, he recommends an after action review, commonly referred to as an AAR, on steroids. Specifically, a complete, honest, objective, soul-searching review of prior conflicts. He cautions that many think, or presuppose, that militaries perform this, but they do not. Murray dismisses the axiom as rhetoric that "generals prepare for the last war and this is why military organizations have a difficult time in the next conflict."[155] Murray continues, "In fact, most armies do nothing of this kind and because they have not distilled the lessons of the last war, they end up repeating most of the same mistakes."[156]

Murray, in a neighboring essay, co-authored with Barry Watts, reinforces this assertion: "There does not appear to be *any* precedent in the entire history of the American military for subjecting past combat experience to the kind of merciless institutional scrutiny manifest in [the] German examination of World War I under secrets that took place during the early 1920s or in 1939 after the Polish campaign."[157] This "merciless scruitiny"[158] was focused on challenges that the German military encountered

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[154] Ibid., 311.

[155] Ibid., 313

[156] Ibid., 313-314.

[157] Barry Watts and Williamson Murray, "Military Innovation in Peacetime," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996), 411-412. This quote was made subsequent to the Persian Gulf War, but pre-dates the current conflicts in the Middle East.

[158] Ibid.

with their tactics and, highly relevant to this paper, equipment.[159] Murray notes that instead of combat experiences, rotations through the Army's Combat Training Centers and Programs, or military exercises in general, can provide an equal amount of substance to scrutinize.[160] However, Murray cautions, the cadre at the centers, programs, and exercises must be careful to avoid manipulating the observed unit's actions into canned, known, or cadre-preferred solutions.

A necessary aid to the scrutiny of past experiences to identify specific problems, and possible solutions, is creative and imaginative thinking. Murray specifically cites the British Army as lacking in this area. This is due to a cultural dimension of the British Army of being an intellectually demanding profession such as those of the legal, medical, and engineering professions. Recent studies suggest that this perception may ring true today for the U.S. Army. Sergeant Major of the Army (SMA) Daniel Dailey, while identifying recruiting challenges unique to the Army, noted a perception of today's Army is that it "does dangerous things" and is "uneducated."[161] This perception is supported by evidence shown in figure 5.

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[159] The author anticipates an argument against the value of this scrutiny by noting that although the scrutiny enabled the German's to seize the initiative in World War II, the initiative was eventually lost due to their poor performance in the logistical and intelligence functions.

[160] Murray, *Innovation: Past and Future*, 326. The author speaks in much broader language by labeling these centers and programs as "exercises and war gaming."

[161] Sergeant Major of the Army Daniel Dailey (speech to the Command and General Staff College, Fort Leavenworth, March 22, 2015).

| | Value Item | Army | Navy | Marine Corps | Air Force | Coast Guard | No Service |
|---|---|---|---|---|---|---|---|
| Top 8 Values | Make a good living | 15% | 12% | 13% | 22% | 11% | 23% |
| | Something to be proud of | 22% | 9% | 35% | 14% | 4% | 14% |
| | Allows you to do great things with your life | 18% | 14% | 21% | 21% | 6% | 17% |
| | A lifestyle that is attractive to me | 9% | 10% | 10% | 19% | 11% | 38% |
| | Safe work environment | 6% | 11% | 5% | 15% | 24% | 36% |
| | Interesting and more than just a daily routine | 15% | 13% | 18% | 23% | 11% | 17% |
| | Opportunity to become stronger | 28% | 8% | 36% | 8% | 3% | 14% |
| | Is futuristic/forward thinking | 11% | 12% | 10% | 45% | 5% | 15% |
| Remaining Values | Offers a strong sense of belonging | 24% | 10% | 33% | 10% | 5% | 16% |
| | Opportunities for unique job responsibilities | 16% | 16% | 15% | 26% | 11% | 14% |
| | Allows you to make a positive global impact | 19% | 24% | 16% | 14% | 11% | 16% |
| | Provides an opportunity for adventure | 18% | 16% | 20% | 21% | 9% | 13% |
| | Offers training in cutting-edge technology | 8% | 12% | 8% | 52% | 3% | 13% |
| | Is with an elite organization | 11% | 10% | 44% | 15% | 4% | 14% |
| | Allows you to serve as protector of your country | 34% | 9% | 24% | 9% | 9% | 12% |

Figure 5. Factors that influence young adults to join the military

*Source:* Created by author using data from DoD Joint Advertising Market Research and Studies, "Ad Tracking Wave 41 Army Presentation: DoD Advertising Tracking Study, Overview of Wave 41 Results (April-June 2013)," August 27, 2013, 35, 43, accessed March 24, 2016, http://dmren.org/app/mrs/advertising-tracking-and-effectiveness/studies/advertisingtracking-study-mdash-active-duty/1337273006.

Buried in Murray's essay is the notion that military commanders are too focused on the now instead of the future. In other words, they are too focused on commanding the present as opposed to the future. Early in his essay, he cites Michael Howard's analogy of an officer's actual time in command with that of "a surgeon [practicing] throughout his life on dummies for one real operation; or a barrister only appear[ing] once or twice in

court towards the close of his career."[162] He bookends this notion with the following: "In the larger picture, educational values among officers require a dedicated commitment to their profession. Only that willingness to think through the business of war will allow leaders to see the potential of long-term innovations."[163] He supplements this notion with an additional component of innovation that demands the engagement of Soldiers with technology applied in the civilian world, but yet awaiting entry into the military's.

In *Patterns of Military Innovation*, author Allen Millett reinforces, among other things, the third leg of Dr. Hill's triad of innovation: persuasion. Any innovative concepts that are sought to take root in the military must understand the politics of the military.

> Senior military commanders and their staffs are not won over by manuals and staff college studies. Unless the prophets can point to field successes (even just in training) and a role in important contingency plans, their disciples will be regarded as [self-proclaimed] military experts who confuse elegant operational ideas with real combat capability.[164]

Millett notes the parallel relationship between innovation that requires large changes in "operational doctrine, personnel reallocation, and cost"[165] and the forces that resist it. The greater the former, the greater the persuasion will be needed to overcome the latter.

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[162] Murray, *Innovation: Past and Future*, 301.

[163] Ibid., 325.

[164] Allen R. Millett, "Patterns of Military Innovation," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996), 359.

[165] Ibid., 361.

*Military Innovation in Peacetime* advances a concept that is fundamental to innovation.[166] The process of innovation can be likened to the law as noted by Otto von Bismark: "Laws are like sausages, it is better not to see them being made."[167] Similarly, "genuine innovation, like democratic government, is unlikely to be a tidy process-much less one that can be tightly or centrally controlled by senior defense managers."[168] But, the authors acknowledge, this is okay; unlike the act of innovating by removing the calories from cola or the caffeine from coffee, any efforts to remove the disheveled, messy, and often prolonged, nature of innovation will result in its demise.[169] Additionally, the authors advance a backstop though to obsessing with past experiences as described in the *Past and Future* essay. Specifically, the military must keep in mind that after all, it is the future that innovation is concerned with; "the commitment to evolve a vision of future war."[170]

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[166] Allen R. Millett, "Patterns of Military Innovation," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allen R. Millett (New York: Cambridge University Press, 1996)

[167] Steve Luxenberg, "A Likely Story. . . and That's Precisely the Problem," *Washington Post*, April 17, 2005, accessed April 23, 2016, http://www.washingtonpost.com/wpdyn/content/article/2005/ 04/16/ AR2005041600154.html

[168] Watts and Murray, *Military Innovation in Peacetime*, 415.

[169] Jesse Lahey, "115: The 4 Lenses of Innovation: Powering Your Team's Creative Thinking, with Rowan Gibson," Engaging Leader, July 1, 2015, accessed April 13, 2015, http://www.engagingleader.com/115-the-4-lenses-of-innovation-powering-your-teams-creative-thinking-podcast/. The idea of innovation by subtraction as applied in the coffee and soda industries was discussed in this recording.

[170] Watts and Murray, *Military Innovation in Peacetime*, 406.

## The Value of Patents

The literature regarding the value, or return on investment of pursuing patents, is ambiguous; i.e. there are no definitive answers as to whether organizations financially benefit from obtaining patent protection for their ideas. Part of this reason is that patents come in different shapes and sizes; some patents are "pioneering"[171] while some represent mere incremental improvement in a particular product (such as the grenade pull pin assembly explored in chapter 1). Further, the quality of a patent, which is often beyond the control of the inventors, impacts its monetary value. One important measuring tool of a patent's quality is how often it was cited in future patents. [172] Generally, the more citations, the higher the quality.[173] However, citations may be generated by the same organization with this express purpose thereby mitigating the value of a citation.[174] Moreover, the so-called strength of a patent can often be misleading. Strong patents can

[171] Robert P. Merges and Richard R. Nelson, "On the Complex Economics of Patent Scope," *Columbia Law Review* 90, no. 4: 854, accessed April 24, 2016, http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=2690&context=facpubs

[172] Robert Hahn, "Economics of Patent Protection: Policy Implications from the Literature" (AEI-Brookings Joint Center for Regulatory Studies, 2003), 23.

[173] Bronwyn Hall, "Overview of my Research on Innovation," UC Berkely and University of Matich, November, 2014, 15, accessed April 26, 2016, http://eml.berkeley.edu//~bhhall/papers/BHH14_research%20on%20innovation_Singapore.pdf.

[174] Hall, "Research on Innovation," 16; Bronwyn Hall, Adam Jaffe, and Manuel Trajtenberg, "The NBER Patent Citations Data File: Lessons, Insights, and Methodological Tools," National Bureau of Economic Research, October 2001, 19-21, accessed April 26, 2016, http://www.nber.org/papers/w8498.pdf. Referred to as "self citations."

result in increased litigation, since others may have an incentive to invalidate the patent.[175] This can thus increase the costs of owning a strong patent.

This section is merely an introductory-overview of three topics related to an organization's pursuit of patent protection. The first topic concerns the decision of an organization to pursue a patent over other mechanisms (e.g. trade secrets) that can protect the value of a patentable innovation. The second topic examines factors that discourage the pursuit of patent protection. The third topic examines factors that encourage the pursuit of patent protection.

A common theme across the literature as to the choice of seeking patent protection for patentable innovation is that there are no general conclusions. There are numerous surveys and analyses of the surveys that aim to make sense of an organization's decision to pursue a patent. However, while many share this aim, most acknowledge there are few common themes.

In the *Economics of Patent Protection-Policy Implications from the Literature,* Robert Hahn of the Brookings Institution, deduces that there are few general lessons gleamed from the economics of patent protection.[176] Hahn cites studies that support conclusions that patent rights spur innovation but also cites studies saying the opposite. One of Hahn's few uncontested assertions is that patent protection spurs technology transfer; i.e. the selling or licensing of patent rights.[177] Further, granting patents to

[175] Merges and Nelson, 916.

[176] Hahn, 2.

[177] Ibid., 4.

research organizations increases technology transfer to industry.[178] Hahn notes that the arguments that do not support the premise that patents spur innovation, never suggest the elimination of patents altogether.[179] Interestingly, he closes his research with a comment on the importance of organizational culture: "Research that ignores the institutional setting of its subject is bound to fall short in explaining the complex relationships between patents and innovation."[180]

Hahn advances three recommendations based on his analysis. First, data collection is critical and it does not receive enough emphasis. He specifically correlates the importance of data collection to government agencies. Second, the implementation of any patent policy changes must accompany careful monitoring. In other words, patent policy changes at the national level, should spur a close evaluation at the organizational level of such policy changes. Third, policy changes should not be anchored to one particular theme of findings. As his study indicates, for many issues regarding the economic benefits of patent protection, most arguments are equally forceful in support of opposite positions.

In *The Use and Value of* Patent *Rights*, a publication of the Strategic Advisory Board for Intellectual Property, economics scholar Bronwyn Hall shares similar thoughts

[178] Ibid., 41.

[179] Ibid., 11.

[180] Ibid., 40

as Hahn; there are few broad sweeping conclusions as to the value of patents. [181] In fact, the author acknowledges that "[m]ost patents are worth very little and a few are worth a lot[,]"[182] while quickly noting that despite their questionable monetary value, they generally spur innovation. [183] In a different study, Hall notes that patenting is trending up; she believes this trend is attributable to the intangible benefits; the "knowledge economy" and also for defensive reasons.[184]

One of the "seminal"[185] studies that analyzes the decision to pursue patent protection over other mechanisms is one conducted by Carnegie Mellon faculty. In *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S.*

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[181] Intellectual Property Foundation, accessed May 2, 2016, www.ipfederation.com/document_download.php?id=266. This organization was created in 2008 and dissolved in 2010.

[182] Bronwyn Hall, "The Use and Value of Patent Rights," Strategic Advisory Board for Intellectual Policy, Intellectual Property Office, June 2009, 18, accessed May 2, 2016, http://www.uspto.gov/sites/default/files/aia_implementation/ipp-2011nov08-ukipo-2.pdf.

[183] Todd Hixon, "For Most Small Companies Patents are Just About Worthless," *Forbes Magazine*, October 4, 2013, accessed May 2, 2016, http://www.forbes.com/sites/ toddhixon/ 2013/10/04/for-most-small-companies-patents-are-just-aboutworthless/ #aefcc2316abb. An article in Forbes magazine marginalizes the monetary value of patents with the bold headline: "For Most Small Companies Patents are Just About Worthless." In the article, one of the author's main points is that even when a company is granted a strong patent, the enforcement of the patent is a nightmare. That is, to legally block a competitor from infringing a patent consumes lots of time and legal fees.

[184] Bronwyn Hall, "Policy for Innovation: Insights from Economic Research," Innovation Policy-Puerto Rico, January, 2014, 22, accessed April 29, 2016, http://eml. berkeley.edu//~bhhall/papers/BHH14_PR_innov_policy.pdf.

[185] Bronwyn Hall, et al., "The Choice Between Formal and Informal Intellectual Property: A Review," *Journal of Economic Literature* 52, 380 (June 2014), accessed May 2, 2016, http://eml.berkeley.edu//~bhhall/papers/HHRS14_IP_choice_lit_survey _JEL.pdf.

*Manufacturing Firms Patent (or Not)* the authors surveyed nearly 1,500 organizations in the mid-1990s U.S. manufacturing sector regarding, among other things, their inclination to patent product innovations.[186] Among the organizations surveyed was an "oversampling of Fortune 500 firms."[187] Notably, federal research organizations are not identified as among the organizations surveyed. Specifically surveyed was "the extent to which firms in different industries chose legal and non-legal methods to secure returns from their inventions."[188] The authors concede that an analysis of such incentives yields an "empirical puzzle."[189] The survey categorized the organizations into 33 industries. The surveys indicated that for product innovations, trade secrets were generally more preferred than the process of obtaining a patent.

As a whole, the industries noted that patent protection is effective for 34 percent of their patentable products. Some industries strongly preferred patent protection such as

[186] Although this data is from the 1990s, one should be careful to dismiss it as outdated, since scholar Bronsyn Hall continues to rely on the data as recent as a 2014 UK workshop. *See* https://eml.berkeley.edu/~bhhall/papers/BHH14_trade_secrets_patents _OECD.pdf. Part of the workshop's findings was a theme consistent throughout this section: there are few, if any sound conclusions about the effectiveness of seeking patent protection.

[187] Wesley Cohen, Richard Nelson, and John Walsh, "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not)" (National Bureau of Economic Research, February 2000), 4, accessed May 2, 2016, http://www.nber.org/papers/w7552.

[188] Bronwyn Hall, et al., "The Choice Between Formal and Informal Intellectual Property: A Review," *Journal of Economic Literature* 52 (June 2014), accessed May 2, 2016, http://eml.berkeley.edu//~bhhall/papers/HHRS14_IP_choice_lit_survey _JEL.pdf.

[189] Cohen, Nelson, and Walsh, *Protecting their Intellectual Assets,* 3.

the medical equipment, drugs, auto-parts, and special purpose machinery industries.[190] Some industries rarely preferred patent protection such as the food, textile, and printing and publishing industries. These industries generally preferred trade secrets over patents. Trade secrets do not require the act of telling the world about the invention as patents do. However, they are difficult to legally enforce as the main enforcing mechanism requires an "unauthorized disclosure"[191] of the secret. [192] Clearly, some industries avoid traveling down the patent road.

The authors cite five reasons that industries choose not to patent an invention.[193] First, the difficulty in obtaining a patent proved to discourage some industries. That is, the ability to convince the USPTO that the invention was novel and non-obvious is too difficult. Second, the patent itself requires the disclosure of too much information; more information than an organization wishes to share with a competitor. Third, and

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[190] Ibid., 33.

[191] United States Patent and Trademark Office, "Trade Secret Policy," accessed May 6, 2016, http://www.uspto.gov/patents-getting-started/international-protection/trade-secret-policy.

[192] The production of Kevlar® by DuPont is an example of a trade secret. Dupont has a history of litigation regarding its enforcement of this trade secret. In 2008, the Federal Bureau of Investigation investigated a former employee of Dupont as to the extent of his relationship with a DuPont competitor, Kolon, a South Korean Corporation. In 2012, Kolon was indicted for, among other things, theft of trade secrets. *See* http://www.ca4.uscourts.gov/Opinions/Unpublished/121260.U.pdf. In April, 2015, it was reported that the dispute was settled out of court. Kolon agreed to pay DuPont $275 million in compensation. *See* Jacob Bunge, "DuPont Settles Trade-secrets Case Against Kolon Industries," *Wall Street Journal*, April 30, 2015, accessed May 4, 2016, http://www.wsj.com/articles/dupont-settles-trade-secrets-case-against-kolon-industries-1430420080#:m4Wrqrmg-28v_A.

[193] Cohen, Nelson, and Walsh, *Protecting their Intellectual Assets*, 14.

overlapping with the second reason, is the relative ease of inventing around an existing patent while avoiding infringement. The fourth and fifth reasons were based on financing: the cost to apply for a patent was discouraging as well as the cost to defend a patent in court against infringement. In terms of the cost, patent applications reportedly cost Army research organizations between $5,000 and $10,000 per application.[194] However, it is not clear what these values consider or do not consider; e.g. attorney services, filing fees, research and development costs, prototype development, etc. Based on the patent filing fees expressed in table 1 of this chapter, this amount seems to greatly exceed the cost of merely USPTO fees. It is also not clear whether each application results in issuance or rejection by the USPTO. One website purports to capture the cost data in figure 6 below. In summary, each of the reasons that organizations choose not to patent are graphically shown in figure 7.

[194] Kay Sullivan Faith, "Patterns of Creation and Discovery: An Analysis of Defense Laboratory Patenting and Innovation" (Pardee Rand Graduate School, 2013), 73, accessed December 14, 2015, http://www.rand.org/pubs/rgs_dissertations/RGSD321.html.

| *Type of Invention* | *Examples* | *Attorneys Fees to Filing* | *Patent Search with Opinion* |
|---|---|---|---|
| *Extremely Simple* | *electric switch; coat hanger; paper clip; diapers; earmuffs; ice cube tray* | *$5,000 to $7,000* | *$1,000 to $1,250* |
| *Relatively Simple* | *board game; umbrella; retractable dog leash; belt clip for cell phone; toothbrush; flashlight* | *$7,000 to $8,500* | *$1,000 to $1,250* |
| *Minimally Complex* | *power hand tool; lawn mower; camera* | *$8,500 to $10,000* | *$1,250 to $1,500* |
| *Moderately Complex* | *ride on lawn mower; simple RFID devices; basic solar concentrator, cell phone* | *$10,000 to $12,000* | *$1,500 to $1,750* |
| *Relatively Complex* | *shock absorbing prosthetic device;* | *$12,000 to $14,000* | *$1,750 to $2,000* |
| *Highly Complex* | *MRI scanner; PCR; telecommunication networking systems; satellite technologies* | *$14,000 to $16,000* | *$2,000 to $2,500* |
| *Software Related* | *Software, automated systems, business methods* | *$16,000 +* | *$2,500 to $3,000* |

Figure 6. Cost of Obtaining a Patent in the US

*Source:* Gene Quinn, "The Cost of Obtaining a Patent in the US," IP Watchdog, April 4, 2015, accessed May 4, 2016, http://www.ipwatchdog.com/2015/04/04/the-cost-of-obtaining-a patent-in-the-us/id=56485/.

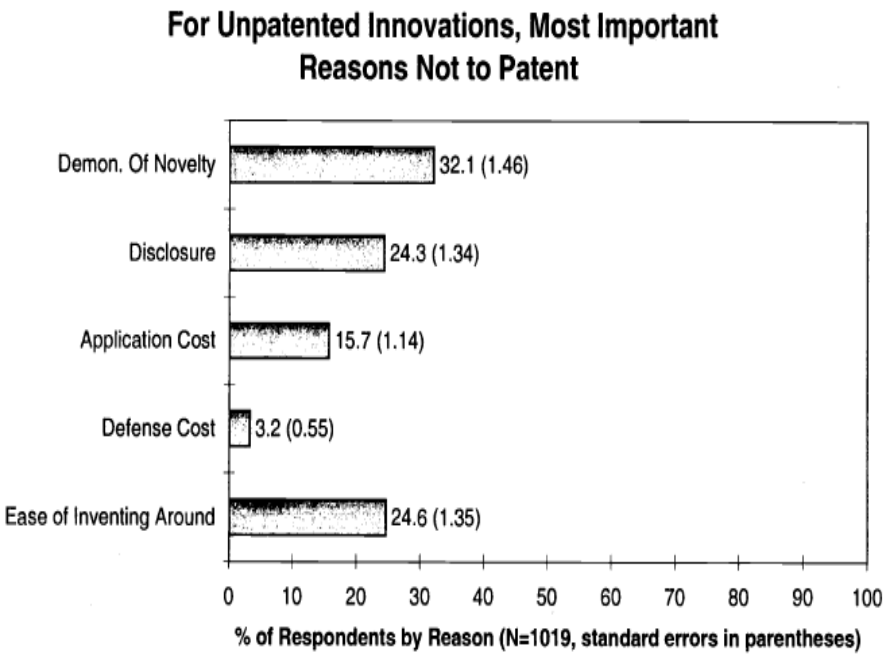


Figure 7. Most Important Reasons Not to Patent

Source: Wesley Cohen, Richard Nelson, and John Walsh, "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not)" (National Bureau of Economic Research, February 2000), accessed May 2, 2016, http://www.nber.org/papers/w7552.47, 47.

The authors cite seven reasons regarding the factors that motivate industries to pursue patent protection. To no surprise, the goal of preventing a competitor from copying the innovation was the overwhelming reason selected by the industries. Of further note, only a small percentage chose their pursuit of patents was motivated by an ability to measure performance. Aligned with enhancing an organization's reputation, another study identified "Improv[ing] a company's image"[195] as another reason for

[195] Hall et al., The Choice Between Formal and Informal Intellectual Property, 384.

pursuing patents. As an example, the German car maker Audi, used patent statistics as a pillar of its 2006 multi-million dollar marketing strategy.[196] Audi noted that NASA filed for 6,509 patents in its lifetime; while the development of the Audi A6 prompted the car company to file 9,621 patents.[197] The reasons for pursuing patents are displayed in figure 8.

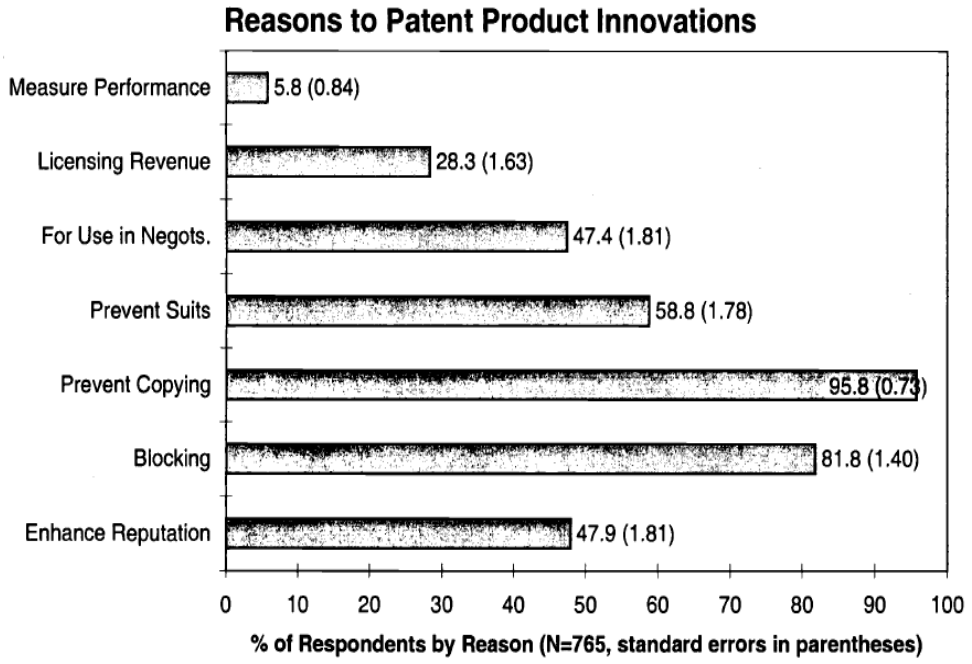


Figure 8. Reasons to Patent Product Innovations

*Source:* Wesley Cohen, Richard Nelson, and John Walsh, "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not)" (National Bureau of Economic Research, February 2000), accessed May 2, 2016, http://www.nber.org/papers/w7552.47, 48.

[196] Ibid.

[197] Ibid.

Lastly, additional benefits of patents exist for the named inventors. A named inventor, by implication, may be judged as creative and forward thinking. A job applicant that can advance a list of patents is equivalent to a scholar advancing a list of publications and may aid efforts to secure employment.[198]

In summary, any analysis of the value of seeking patent protection is non-linear and varies widely depending on the industry, organization, and numerous other factors. Moreover, any assertions of definitive conclusion as to the merits of patent protection must be treated with skepticism along with a detailed inquiry into the context surrounding such conclusions. This section merely purports to introduce the reader to the main topics regarding the benefits of pursuing patents.

## Inventions by Soldiers

There is no shortage of literature documenting inventions related to the military. This literature gets narrowed once the inventions are narrowed to Soldiers, as opposed to inventions developed by the Army's research organizations.[199] This literature gets even further narrowed, once the inventions by Soldiers is matched up with a name and rank of the Soldier, thereby assuring the status of a Soldier.[200] The inventions described herein

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[198] John Premo, "Some Intangible Benefits of the Patent System," *Journal of the Patent and Trademark Office Society* 41 (1959): 285.

[199] An example of such is ENIAC. Arguably, the world's first general computer invented by Army scientists.

[200] For example, *Closing with the Enemy* by Michael D. Doubler, is an exhaustive review of innovations and technical adaptions on the battlefield, but, other than a couple specific examples, lacks the correspondence of a specific device with an inventor, or group of inventors.

are not necessarily patented, or ever adjudicated to be patentable. Accordingly, most are not subject to the gates of the patent statutes. The literature reviewed herein extends from wars of the 20th century to recent conflicts in the Middle East.

*GI Ingenuity*, by James Jay Carafono, explains in detail various forms of innovation that enabled victory in combat. Most of the detail centers on both World Wars. The title depicts the combination of brilliant generals deploying overwhelming masses and equipment to the battlefield, the adaption of company level Soldiers to account for what the generals did not expect, and, most applicable to this research, the ability of soldiers in the field to invent. Inventions by Soldiers in the field often include devices that enhance mobility.

First, Culin's cutter, as introduced in chapter 1 of this research, is deserving of a close review.[201] Culin's cutter was conceived as most inventions are: through identifying a problem. Otherwise known in business circles as establishing a "demand signal."[202] The demand signal was lit by General Gerow during his inspection of the 102nd Cavalry Squadron. Gerow was aware of the problem caused by the enemy's network of hedgerow defenses. These natural earthen barriers wreaked havoc on tanks attempting to traverse across the country side in pursuit of the enemy. He simply asked a company commander what was being done about this problem and the commander lamented that his outfit did not have an answer. The General just as simply told the commander to find a solution. The commander gathered a team of Soldiers and collaborated. One of those Soldiers was

[201] Carafano, *GI Ingenuity*, 123-126.

[202] Chao, 111.

Sergeant Curtis Culin, a 29-year-old, National Guardsman from the New York City area. Culin, likened this problem with the havoc of snow on mobility in the Northeast winter landscape. The tanks needed something like a snowplow to plow through the hedgerows.

This analogy got Culin's maintenance officer, Lieutenant Litton thinking. Litton thought of adding a fork to the plow. The team even noted the excess metal scrap available to them courtesy of the enemy's iron beach obstacles scattered along the French shore of the English Channel. The idea took off.

The team demonstrated their invention, and failed. The forks were no match for the hedgerows. That is until someone supplemented their efforts with the idea they were not being forceful enough with the tank. The tanks tried again, this time, full speed ahead, forks attached, and they broke through. Culin's idea, named Culin's cutter once affixed to tanks was used similarly to how a rhinoceros uses its tusks. The tanks, with cutters affixed, were aptly named Rhino Tanks. Culin was awarded the Legion of Merit and even ended up meeting General Eisenhower who lauded Culin's ingenuity. Some scholars assert that Culin's invention was critical to the Allies efforts in "winning the Battle of Normandy."[203]

Second, in a more recent application, a collection of National Guardsmen invented a device that aimed to defeat the lethal improvised explosive devices (IEDs) scattered along Iraqi highways.[204] Their efforts were sparked, just like Culin's cutter, from their superior making a demand for innovation. In this case, the superior was their

[203] Ibid., 126.

[204] Ibid., 226.

brigade commander, Colonel Michael Steele of the 101st Airborne Division. Apart from their military duties, these troops from Michigan were a collection of mechanics, electricians, and carpenters. IEDs were a persistent and lethal problem throughout Iraq. The Guardsmen invented a dual purpose device. One purpose was to detonate the IED before their troop-carrying vehicle was on top of it; another purpose was to prevent the IED detonation entirely. The Soldiers manufactured a six foot boom on their vehicle that extended forward. Affixed to the boom were devices aimed to detect and, if warranted, detonate the IED. Their efforts surely resulted in at least one premature detonation or prevented an IED detonation entirely thereby saving lives.

In *A History of Innovation,* a series of authors discuss various innovations of the Army throughout the 20th century.[205] While the inventions described in *GI Ingenuity* enhanced mobility, the inventions described in this book enhanced weapon systems. Most of the weapon system improvements were made by Soldiers. The M1 Garand and the speed shifter for the 155 mm. howitzer each have a story of their own as to their evolution.

During the Interwar period of the 20th Century, the Army actively sought a solution to its inability to field an adequate semiautomatic rifle. The rifles that were adequate for combat such as the Springfield Model 1903 (M1903) required its user to take action to not only remove the spent shell casing but also to reload the next bullet. The goal was to invent a weapon that automatically discarded the used shell and reload, all with the mere effort of pulling the trigger. However, more importantly, this weapon

[205] Jon Hoffman, *A History of Innovation: U.S. Army Adaption in War and Peace* (Washington, DC: U.S. Army Center of Military History, 2009).

required the favorable characteristics of durability, weight, and power. The solution to this problem was developed by John C. Garand, a National Guardsman, employed by the Army's Springfield Armory. Garand's solution, the M1 Garand rifle was protected through the filing of a patent application on April 21, 1930 and subsequently issued as a patent on December 27, 1932.[206] Garand's invention, notes a veteran, "took rain, mud, windblown sand, bruises, and abrasions...and kept on working."[207] The same veteran noted that the rifle was "the best thing the Army ever [issued to him]."[208] General George S. Patton declared that it was "the greatest battle implement ever devised."[209]Garand's invention was used by the Army in Korea and even into the early part of the war in Vietnam.

In the war in Vietnam, one of the hallmarks of combat was the firebase. Accordingly the tactics to defend the firebase were of the utmost importance. One of the challenges in defending these firebases was the limited mobility of the powerful 155mm howitzer. Enemy threats within the 45 degree range of fire of the howitzer were an easy target for it. However, threats beyond this range required a burdensome and laborious process to maneuver the howitzer so it can engage such a threat. Needless to say, this process of maneuvering the howitzer was usually under intense fire and stress. Enter Reserve Officer Training Corps graduate 1LT Nathaniel W. Foster, Jr. and his team of

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[206] J. C. Garand, "Semiautomatic Rifle," U.S. Patent No. 1,892,141, Washington, DC: U.S. Patent and Trademark Office, December 27, 1932.

[207] Hoffman, *History of Innovation*, 12.

[208] Ibid., 13.

[209] Ibid.

artillerymen from Bravo Battery, 8th Battalion, 6th Artillery. His team set out to find a solution for a more versatile howitzer. 1LT Foster's team tried numerous demonstrations that resulted in failure. Finally, through exercising steadfast disciplined initiative, as a result of the lessons learned from the prior failures, along with a persistent and committed focus on finding a solution, his team invented the artillery speed shifter. The resources to maneuver the howitzer went from eight Soldiers and several minutes to two Soldiers and less than 19 seconds. 1LT Foster and his team's shared understanding of the problem along with their disciplined initiative fueled this "example of ingenuity of artillery innovations."[210]

In *Armament & History*, J.F.C. Fuller advances a thorough, yet concise, history of the development of arms from the club to the nuclear bomb.[211] The book is divided into "Ages" with the Age of Chivalry and the Age of Atomic Energy as examples. These chapters take the reader in chronological order from the Greco-Persian Wars of 490 B.C. to August 9, 1945. Fuller establishes the importance of progressive improvements and developments in armament to success in combat. While he details the timing of countless armament inventions, the inventorship is often disregarded.

Few areas of military literature can be complete without delving into its intersection with the works of Carl von Clausewitz. Inventions on the battlefield, or more generally, technology, is an area Clausewitz rarely recognizes, perhaps for a highly rational reason. In *Clausewitz in the Age of Technology*, Michael Handel reconciles

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[210] Ibid., 143.

[211] J. F. C. Fuller, *Armament and History* (New York: De Capo Press, 1998).

Clausewitz's apparent marginalization of technology.[212] He argues that the lack of technological advancements during Clausewitz's life, prevented him from appreciating the impact of such. In fact, the railroads were not brought to Europe until shortly after Clausewitz's death. He goes beyond asserting an inadvertent dismissal of the impact of technology; Handel basically says that the dry technological climate prevented Clausewitz from appreciating technology. However, he blends technological advancements, as could have been contemplated by Clausewitz, into surprise. Generally, the greater advancements in technology, the greater the opportunity for surprise; from advancements in mobility and intelligence. But, Handel believes that if Clausewitz was alive in the era of the industrial revolution, or even witnessed a battle in 1866, his trilogy of the military, the government, and the people, would have had an additional component: technology. In sum, there has been no substitution as of this book's writing for a military theorist like Clausewitz, but such a classic writing does not prevent one from reconciling an apparent flaw.

To the contrary, one may disagree with Handel that Clausewitz ignored technology in *On War*.[213] He actually expressly discusses inventions. He groups inventions into actions that involve the preparations for war; not the conduct of war itself as much of his work is devoted to.

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[212] Michael Handel, *Clausewitz and Modern Strategy* (London: Frank Cass and Company Limited, 1986).

[213] Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976).

In addition to those inventions depicted in historical literary works, open-source internet searching yields media articles that promote inventions of Soldiers. There are three categories of such articles to discuss. First, are articles concerning the United States Military Academy (USMA). There are several articles that summarize partnerships between USMA and Army research organizations that aim to capture patentable inventions. "Projects Day" is an annual event of USMA that, according to its Dean of the Academic Board, is "a transparent display of the intellectual capital of [USMA cadets]."[214] USMA lacks patent attorneys so it relies on patent attorneys external to its organization, such as the U.S. Army Armament Research, Development and Engineering Center's (ARDEC) patent attorneys.

ARDEC has been assisting USMA with patent prosecution since 2010.[215] The 2012 Projects Day produced eight possible patentable inventions.[216] The ARDEC team, presumably based on a search of the prior art and a review of ARDEC's mission as a research organization, chose to seek patent protection on three of the eight possible patentable inventions.[217] The three selections for patent protection were titled: Penetrating Anchor Projectile, On Demand Thermal Protection Gear, and Exoskeleton for Rucksack Support. A search of issued patents did not provide conclusive results as to whether the USPTO issued patents for either of these selections.

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[214] Timothy Rider, "Picatinny Supports Patenting West Point Cadet Inventions," May 22, 2013, accessed February 12, 2016, http://www.army.mil/article/103448/.

[215] Ibid.

[216] Ibid.

[217] Ibid.

With more definitive success, it appears that U.S. Patent 9,074,856 to Frietag et al., "Gun-Launched Anchor Projectile for Climbing," (hereinafter '856) was filed on April 18, 2013 by ARDEC. [218] The inventors for this patent are USMA cadets.[219]A drawing in an article that provides some factual information about the patent is strikingly similar to one of the drawings in '856.[220] Further, the cadet-inventors mentioned in the article are listed as the named inventors on the patent. The article further explains that '856 was an entry, in its pre-application status, in an event named the Service Academy Design Challenge.[221] Cadet teams at USMA received funding in the fall of 2011 from the Air Force Research Laboratory as part of their mechanical engineering curriculum.[222] This patent evinces the capability of USMA cadets to develop an invention that, with the assistance of ARDEC, matured into a patent.

[218] United States Patent and Trademark Office, Patent no. U.S. Patent 9,074,856, Patent Application Information Retrieval, accessed February 15, 2016, http://portal.uspto.gov/pair/PublicPair accessed on February 15, 2016. This patent stems from a provisional application no. 61/813,230.

[219] U.S. Army Research Laboratory, "[Army Research Laboratory] Mentors Help West Point Cadets Create Patent Potential Rock-Penetrating Scaling System," June 26, 2012, accessed February 12, 2016, http://www.arl.army.mil/www/? article=975.

[220] Ibid.

[221] Ibid.

[222] Specifically, the course is titled Engineering Design and Mechanical Systems Design.

In addition to its partnership with ARDEC, USMA has a partnership with the Natick Soldier Research, Development and Engineering Center (NSRDEC).[223] This is another "Projects Day" event; although this event is officially titled "USMA's and NSRDEC's Projects Presentation Day." This event, unlike ARDEC's event, is on site at NSRDEC in Natick, Massachusetts. According to a USMA Assistant Professor, the Cadets are valued for collaborating with the NSRDEC for, among other things, their "fresh thinking."[224] The cadet teams, over the course of a school year, strive to develop improvements to existing technologies, presumably in the form of patentable inventions. The article does not indicate whether NSRDEC pursued patent protection for any of the design improvements. Further, the article does not expressly mention funding allocations, but does identify a memorandum of understanding[225] between USMA and NSRDEC that enables this collaboration. This partnership is described as a "win-win" and "a good return on investment" according to the Lead, Emerging Concepts & Technologies, Warfighter Directorate, at NSRDEC.[226]

A second category of articles involves, similar to the Soldier-inventions described above, a prospective patentable invention. Some Soldiers, during combat in Afghanistan,

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[223] Jane Benson, "Project Presentation Day highlights NSRDEC and USMA Collaborative Efforts," May 7, 2015, accessed March 15, 2016, http://www.army.mil/article/148081/Project_Presentation_Day_highlights_NSRDEC_and_.

[224] Ibid.

[225] NSRDEC Public Affairs, "Natick, West Point Continue Collaborative Research," December 18, 2015, accessed March 15, 2016, http://www.army.mil/article/160217/Natick__West_Point_continue_collaborative_research/. This article discloses that the memorandum of understanding is a three-year long partnership.

[226] Ibid.

developed a device that fed ammo to their Mark-48 machine gun. The Soldiers sought an improvement to the magazine feeding device that accompanies the Mark-48. Their solution featured a combination of known products such as ruck sack frame, spare ammunition cans, and an equipment pouch. After some modification to these devices and some welding, they developed the self-named "Ironman Pack Ammunition System."[227] This prospective invention garnered recognition at the "Army's Greatest Invention Competition."[228] A description of the device, subsequent to its use in combat, was submitted to a forward deployed element of AMC, and subsequently routed to NSRDEC for refinement and, presumably patent protection.[229] It is not clear whether NSRDEC filed a patent application for this device.[230]

In summary, history is embedded with Soldier-inventors. This research purports to capture just a few of the Army's seminal Soldier-inventors. Their contribution to the Army's efforts are incredible and inspiring displays of initiative and ingenuity.

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[227] Dar Danielson, "Iowa Soldiers Win Army Award for their Innovation," Radio Iowa, December 3, 2011, accessed February 15, 2016 http://www.radioiowa.com/2011/12/03/iowa-soldiers-win-army-award-for-their-invention/.

[228] Ibid.

[229] Bob Reinert, "Ironman' a Game-Changer on the Battlefield," October 14, 2011, accessed February 15, 2016, http://www.army.mil/article/67318/.

[230] Soldier Systems, "US Army Developed Ironman Ammo Pack Costs More than Commercial Version it Emulates," accessed May 3, 2016, http://soldiersystems.net/2014/09/21/us-army-developed-ironman-ammo-pack-costs-more-than-commercial-version-it-emulates/. A blog alleges that the Ironman Pack was actually a commercial product prior to the Soldiers inventing the device on their own. Perhaps patent protection was not sought for the Ironman Pack because any difference between it and the alleged commercial version was an obvious improvement, and thus not capable of receiving patent protection.

## Army Patents

While history is replete with Soldier-inventors, records are scarce as to which Soldiers actually pursued patent protection for their inventions.[231] Obviously, John C. Garand was one example. Patents are the subject of this research, so a review of the inventorship of the U.S. Army's patents is needed. The USPTO issues patents to the Army as represented by the Secretary of the Army. Table 10 shows a general overview of the statistics that are readily available regarding the Army's patents.[232] In order to provide some context for the Army's statistics, the statistics of the U.S. Navy and the U.S. Air Force are presented as well.[233]

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[231] 28 U.S.C § 1498 is a remedy for patent owners that relieves Soldiers in combat from any concerns of patent infringement. It enables patent owners to seek compensation from the U.S. government for its exercise of eminent domain, not in the context of seizing real property, but in the context of seizing intellectual property. The statute is a waiver of sovereign immunity and is the only remedy for seeking compensation from the federal government. For example, Culin's cutter as introduced in Chapter 1, invented a device that is affixed to a tank. The mere fact that such a device is patented in the U.S. does not prevent the military from using this device in combat. Such a use would provide the patent owner, upon the owner learning of such use, a remedy for financial compensation in court.

[232] United States Patent and Trademark Office, USPTO Patent Full-Text Image Database, accessed February 15, 2016, http://patft.uspto.gov/netahtml/PTO /search-adv.htm. The entering of the following search terms in the query box yields the corresponding number of patents issued to the Army in a respective year: apt/1 and an/army and an/united and isd/yyyy. The "yyyy" designation is not literally entered; the four digit year is entered as appropriate. For example, for the year 2009, the following search terms are used: apt/1 and an/army and an/united and isd/2009.

[233] United States Patent and Trademark Office, USPTO Patent Full-Text Image Database, accessed March 3, 2016, http://patft.uspto.gov/netahtml/PTO/search-adv.htm. The entering of the following search terms in the query box yields the corresponding number of patents issued to the Navy and Air force respectively in a specific year: apt/1 and an/navy and an/united and isd/yyyy; and apt/1 and an/force and an/united and isd/yyyy. The "yyyy" designation is not literally entered; the four digit year is entered as

Table 10. Patents Issued, by Service, Calendar Years (CY) 2007-2015

| | **2015** | **2014** | **2013** | **2012** | **2011** | **2010** | **2009** | **2008** | **2007** |
|---|---|---|---|---|---|---|---|---|---|
| Army | 169 | 160 | 160 | 177 | 131 | 149 | 122 | 132 | 143 |
| Navy | 362 | 365 | 400 | 360 | 319 | 305 | 233 | 230 | 268 |
| Air Force | 59 | 53 | 59 | 56 | 47 | 44 | 48 | 39 | 36 |

Source: Created by author using data from www.patft.uspto.gov, accessed February 15, 2016.

There are few sources that go into any detail regarding the numbers described above, particularly as to the Army's patents. A recent study explored patent trends within DoD research organizations (including the Army's research organizations).[234] In *Patterns of Creation and Discovery* the author's focus is on the classes of patents.[235] This focus enables innovation patterns to be charted in histograms and s-curves. The s-curve pattern for example, breaks down the cycle of issued patents in a particular class into 4 separate regions: emerging, growth, maturity, and saturation. Ideally, an inventor with hopes of obtaining a patent that is cited by future patents hops onto the s-curve in the emerging or growth phase. [236] The maturity phase is where the innovative leaps in a particular

appropriate; for example, for U.S. Navy in the year 2009, the following search terms are used: apt/1 and an/navy and an/united and isd/2009.

[234] Faith, *Patterns of Creation and Discovery,* 73.

[235] Classes, as defined in greater detail in the definitions section of Chapter 1, are what the USPTO uses to organize patents based solely on the subject matter of the patent. Note that there is often overlap for patents; i.e. not every patent cleanly fits into one specific class or subclass of either the United States Patent Classification System or the Cooperative Patent Classification.

[236] Citations are used by some as a way of measuring the value of a patent. A patent that is cited by a future patent represents that the future patent is in some manner building off of, or further developing, the cited patent.

technology tend to reduce in gravity. The saturation region is one of incremental innovation. The ability to provide novel incremental innovations in a particular class gets narrower and narrower in this phase. Accordingly, the return on investment is not as great as during the emerging region. Also, many businesses that were previously active in applying for patents in the mature region, are no longer motivated to continue to pursue such incremental innovative advances in a given technology. In order to develop these s-curves and histograms, the author recognized the need to filter each of the services' patents by research organization.[237]

The author contemplated determining the research organization's patents based off of the hometown of the named inventors. For example, if the inventors generally lived in Alabama, then the research organization would be a research organization headquartered in Alabama.[238] In the end, the author relies on a third-party website, DoD Techmatch, to determine which research organization prosecuted a respective patent. The author recognizes that there are many inconsistencies readily apparent between such correspondence, but for purposes of the research, this correspondence enabled patent trends to be analyzed.

The author in addition to focusing on the classes of each patent, also greatly heeded the mission of each patent's prosecuting organization as shown below in table 11.

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[237] This particular discussion merely scratches the surface of an entirely separate concept of intellectual property that is a delimitation in this research as described in chapter 1.

[238] This method of corresponding patents to its respective research organization, while merely contemplated by the author, has its flaws as discussed *supra.* It is highlighted here to indicate the challenges of ascertaining which research organization is responsible for prosecuting a respective patent.

In addition, to providing an interesting and fairly comprehensive analysis of the DoD's innovation patterns based on a research organization's patents, the author provides a valuable list of references that enable further research.

Table 11. Overview of the Areas of Focus of each of the Army's Primary Research Organizations

| Research Organization | Focus Areas |
|---|---|
| Aviation and Missile Research, Development and Engineering Center | Air Vehicles, missiles |
| ARDEC | Armaments |
| ARL | Various |
| Communications-Electronics Research, Development and Engineering Center / Communications-Electronics Command (CECOM) | Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance |
| Edgewood Chemical and Biological Center (ECBC) | Non-medical chemical and biological defense |
| EDRC | Army Corps of Engineers, structures, information technology, mapping, operating in various environments |
| NSRDEC | Food, clothing, human factors, biotech, materials, lasers, magnetic resonance imaging |
| Tank Automotive Research, Development and Engineering Center / Tank-automotive Armament Command (TACOM) | Armor, tanks |
| Medical Research and Materiel Command (MRMC) | Medical |

*Source*: Kay Sullivan Faith, "Patterns of Creation and Discovery: An Analysis of Defense Laboratory Patenting and Innovation" (Dissertation, Pardee Rand Graduate School, 2013), 134, accessed December 14, 2015, http://www.rand.org/pubs/rgs_dissertations/ RGSD321. html.

## Summary

This chapter introduced the reader to a wide variety of resources that will enable answers to the secondary research questions. First, patent laws and the USPTO's patent process was explored. Second, the Army's patent application process was reviewed. The third section of this chapter involved a detailed review of literature regarding organizational culture. Included in this review were several works that analyzed the Army's cultural dimensions. The fourth section of this chapter involved an introductory overview of the benefits of an organization's pursuit of patents. Lastly this chapter concluded with a review of the historical and relatively current operating environments with respect to Soldier-inventorship. Chapter 4 will provide an analysis of much of the material explored in this chapter. Chapter 5 will then provide an assortment of conclusions and recommendations.

# CHAPTER 3

# RESEARCH METHODOLOGY

The purpose of this research is to determine if the U.S. Army's regulations and culture adequately foster a Soldier's pursuit of patentable innovations. Qualitative research of existing literature was conducted to evaluate past Soldier-inventions and the hallmarks of an innovative culture. This enabled an analysis of the Army's culture concerning innovation. The literature identified a major gap that must be filled in order to answer the primary research question.

The primary gap concerned background data of the inventorship identified on a patent. As such, additional qualitative research was conducted to analyze publicly available data pertaining to the Army's patents. The product of this analysis in its abbreviated form is discussed in chapter 4. The product of this analysis in its extended form is found in Appendix A, B, and C.

Lastly, an interview was conducted with an attorney from ECBC to provide insight into the extent that Soldiers are involved in the inventorship of a particular research organization's patents. This interview was conducted through electronic mail and is attached as Appendix E. A second interview was conducted with the Intellectual Property Counsel for AMC. This second interview provided overarching insight into the extent that Soldiers are involved in the inventorship of AMC's patents. The significance of AMC to this research is explained in chapter 4.

# CHAPTER 4

# ANALYSIS

There are few sources that evince whether Soldiers are capable of developing *patentable* innovation. Initially, a review of literature yields several devices invented by Soldiers: Culin's cutter, the artillery speed-shifter, the M1 Garand, and even inventions by USMA Cadets to name a few. Some of these inventions mature into patents like the M1 Garand and one of the USMA Cadets' inventions.[239] The inventions are enabled by a Soldier's innovation that is often fueled by partnerships with research organizations such as ARDEC or NSRDEC. Accordingly, as Clausewitz notes, "the combination of several events, make it possible to deduce"[240] that Soldiers are, indeed, capable of developing patentable innovation.

This chapter first attempts to determine the precise number of Soldier-inventors, with respect to the Army's patent portfolio, in today's operating environment. This is made possible with two USPTO databases and two interviews. The two databases are the Patent Full-Text and Image database (PatFT) and the Patent Application Information Retrieval (PAIR) database. The two interviews were conducted through electronic mail with two AMC patent attorneys.[241] Subsequent to this determination, an analysis of the

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[239] *See* Ryan Freitag et al., "Gun-Launched Anchor Projectile for Climbing," U.S. Patent No. 9,074,856, Alexandria, VA; U.S. Patent and Trademark Office, July 7, 2015; J.C. Garand, "Semiautomatic Rifle," U.S. Patent No. 1,892,141, Washington, DC: U.S. Patent and Trademark Office, December 27, 1932.

[240] Clausewitz, 171.

[241] The electronic mail interviews are shown in Appendix D and E. The interview shown in Appendix D with Attorney George Winborne was preceded by a telephone

Army's regulations and its cultural dimensions is conducted to identify enablers and disablers of Soldier-inventions. This chapter closes with an analysis of the benefits of Soldiers pursuing patentable innovations

## Soldier-Inventors

It is difficult to ascertain the number of Soldiers that are named inventors of the Army's patents. There are a few websites that identify the total number of patents issued annually to the Army.[242] Table 10, in chapter 2, shows that in recent years, there are usually about 150 patents issued per year. One would probably surmise that Soldiers contributed, at least to the threshold of inventorship, which as discussed in chapter 2 is not exceedingly high, to at least a handful of these patents each year. After all, Soldiers are the users of the Army's equipment. They are thereby in the best position to identify problems or shortcomings with the equipment and, consequently, provide solutions.

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conference and several related electronic mail messages. The interview in Appendix E with attorney Ulysses John Biffoni is the entirety of this author's collaboration with him.

[242] Intellectual Property Owners Association, "Top 300 Patent Owners," accessed April 11, 2016, https://www.ipo.org/index.php/publications/top-300-patent-owners/. This website avails an exhaustive summary of annual reports that track the number of patents issued to various organizations. The numbers do not entirely correspond with the numbers shown in table 10 of chapter 2 at least with respect to the Army's patents. For example, in 2014 the report indicates that the Army was issued 155 patents. This number is slightly off of the number shown in table 10 (and detailed in Appendix B). Also *See* United States Patent and Trademark Office, "Calendar Year Patent Statistics (January 1 to December 31) General Patent Statistics Reports Available for Viewing," accessed April 3, 2016, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports_topo.htm. A menu of lists similar to the previously mentioned are available for calendar years 1995 through, as of accessing this site, 2015. It is further observed that the numbers evinced in these lists do not entirely correspond with those in table 10. For example in 2014, the lists show 155, 364, and 54 patents issued to the Army, Navy, and Air Force respectively. Table 10 shows 160, 365, and 53 patents issued to the Army, Navy, and Air Force, respectively.

These solutions can either spark patentable innovations or comprise patentable innovations in and of themselves. It is the magnitude of these patentable innovations that this chapter intends to reveal.

Any inquiry into the Army's patents to learn the extent that Soldiers are among its named inventors yields a labyrinth of searches. To be sure, there is a path through this labyrinth. However, this path is only illuminated with the help of dozens of navigational aids. Most of these aids are the patent attorneys of AMC because, as shown below, the vast majority of the Army's patents are prosecuted by AMC organizations. If there were other organizations prosecuting dozens of patents each year, there would be other organizations with navigational aids to illuminate paths through this labyrinth.

The number of Soldier-inventors named on the Army's patents is a statistic that is simply not tracked. This research, as best understood, is the first attempt, of hopefully many future ongoing efforts, to track such information. The only way to determine whether Soldiers are patenting their inventions is to first identify Army organizations that prosecutes patents and then second, query these organization regarding their patents' inventorship. In other words, it is only through organizing the Army's patents into respective bodies of water, and then navigating through each body of water, that one can ascertain whether Soldiers are among the Army's patents' named inventors.

The search through the labyrinth of determining the number of Soldier-inventors, begins with analyzing each patent issued to the Army. Issued patents do not provide inventor-details other than the full name and the hometown of each inventor. Further, all of the patents issued to the Army are issued to the Army as an organization; that is, they are not issued to a subordinate command such as AMC or Army Forces Command.

Sometimes, though far from always, a quick analysis of the Army's patents through information accessible on the USPTO's databases indicates a subordinate command.[243] In furtherance of this search, there is a linchpin that aids in organizing the patents by organization. This linchpin begins to surface as more and more of the Army's patents are analyzed for common themes. That linchpin, and navigational aid through the labyrinth, is the prosecuting attorney for the patent.

Each patent, on its face, has a legal representative identified.[244] For the Army's patents, the legal representatives are patent attorneys employed by the Army; more specifically, the patent attorneys are employed by a particular research organization. This correlation between a patent attorney and their research organization enables the patents to be grouped by research organization. Before proceeding it is worth noting that this correlation is necessary because there is no accessible literature that groups the Army's patents by research organization. A recent study identified this same issue but relied on information in a DoD database known as IPTechmatch.[245] This database is not suitable for this research because it is fails to account for all of the Army's patents in a given

[243] United States Patent and Trademark Office, USPTO PatFT, accessed March 3, 2016, http://patft.uspto.gov/netahtml/PTO/search-adv.htm. For example, U.S. Patent 9,172,476 to Nguyen et al., indicates on its face that the U.S. Army Research Laboratory is the patent's applicant.

[244] As indicated repeatedly throughout this paper, any efforts to pursue patent protection should be supplemented with the advice of a registered patent attorney.

[245] *See* Faith, "Patterns of Creation and Discovery." The IPTechmatch database may be accessed at the following web address: https://iptechmatch.com/login.xhtml.

period of time (which this research intends to do). Specifically, the author notes that the database accounted for 79 percent of the Army's patents between 1998 and 2005.[246]

Once the patents are grouped together, common themes emerge that confirm that grouping patents by their prosecuting attorney is a reliable method to organize the Army's patents. For example, as evident from the USPTO's PatFT, attorney Ulysees John Biffoni is named as the legal representative for 19 of the 169 patents issued to the Army in CY 2015.[247] These 19 patents, when grouped together, reveal a common theme of chemical decontamination and detection devices, along with obscuration generating devices.[248] A review of the Army's research organizations and their focus areas as shown in table 11 of chapter 2 indicates ECBC as an organization that may be responsible for these 19 patents.

The use of another USPTO database, Patent Application Information Retrieval (PAIR), enables a closer review of individual patents.[249] This database enables research to confirm or disconfirm conclusions regarding the prosecuting Army organization (such

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[246] Faith, *Patterns of Creation and Discovery*, 27-28.

[247] United States Patent and Trademark Office, USPTO PatFT, accessed March 3, 2016, http://patft.uspto.gov/netahtml/PTO/search-adv.htm. The entering of the following search terms in the PatFT query box yields 19 patents issued to the Army in 2015 that were prosecuted by attorney Ulysees John Biffoni: apt/1 and an/army and an/united and isd/2015 and lrep/Biffoni. This method of searching assumes that the last name is correctly spelled. However, the search terms provide a work-around for this with the use of the $ operator: apt/1 and an/army and an/united and isd/2015 and lrep/Bif$. The use of this operator merely requires that at least the first three letters of the attorney's last name was spelled correctly.

[248] *See* US Patents 9,216,404; 9,063,046; 9,046,334; and 8,955,442.

[249] This database retrieves correspondence exchanged between the USPTO and the prosecuting attorney throughout the prosecution history of a specific patent.

as the conclusion made in the previous paragraph). Additionally, information that is not evident from the patent itself, can be unearthed through exploring the patent's prosecution history. PAIR offers useful information because sometimes it is difficult to link a research organization with its respective legal representatives even with the information accessible in PatFT.

A closer analysis of ECBC's 19 patents in PAIR confirms that attorney Biffoni represents ECBC as its legal representative (as suggested by the information learned from the PatFT, and confirmed by the information in PAIR).[250] A review of U.S. Patent 9,046,334 to Redding, as prosecuted by attorney Biffoni, expressly indicates on the patent's cover page that the applicant is ECBC.[251] However, a review of another patent prosecuted by attorney Biffoni, namely, U.S. Patent 9,155,924, to Grove et al. does not immediately indicate ECBC as the applicant.[252] Instead, the address for correspondence with the attorney is listed as the Intellectual Property Law Edgewood Division.[253] An alternative correspondence, for the same patent, addressed from the USPTO, is addressed

[250] United States Patent and Trademark Office, Patent Application Information Retrieval, accessed April 23, 2016, (Patent number 9,155,924), http://portal.uspto.gov/pair/PublicPair. The bibliographic data sheet with mail room date of January 21, 2010 reveals the ECBC as the address for correspondence regarding the patent.

[251] United States Patent and Trademark Office, Patent Application Information Retrieval, accessed April 23, 2016, (Patent number 9,046,334), http://portal.uspto.gov/pair/PublicPair. The patents can be found under the tab named published documents. ECBC is named as the applicant for this patent. Alternatively, the applicant is displayed at the home page for each patent retrieved in PAIR.

[252] United States Patent and Trademark Office, Patent Application Information Retrieval, accessed April 23, 2016, (Patent number 9,155,924), http://portal.uspto.gov/pair/PublicPair. For this patent, there is no applicant identified.

[253] Ibid.

to the Biological Chemical Command at Aberdeen Proving Ground.[254] A conclusion may eventually be reached that attorney Biffoni represents ECBC in this organization's prosecution of patents. Furthermore, in an interview, attorney Biffoni confirmed that he prosecutes "all of ECBC's patents."[255] This is the level of analysis and research into many of the Army's issued patents to confirm, or ascertain in the first place, the Army entity that prosecuted the patent.

Once an attorney is linked to an Army entity, usually a research organization, most patents prosecuted by said attorney can be easily traced back to that organization. The hard part is creating the link in the first place, as there are no publicly accessible rosters that link attorneys to the research organizations they represent. It is this fact that demands the additional probing of a patent as described above.

This research analyzed patents from 2013 through 2015 to categorize the patents based on its owning Army organization. Each of these patents, along with their prosecuting attorney and corresponding research organization, are listed in Appendix A, B, and C for CY 2013 through 2015 respectively. Patents that do not have a research organization tied to it would likely be those patents that hail from the U.S. Army Legal Services Agency (USALSA). It is assumed that USALSA is the organization best suited to prosecute patents for Soldier-inventors (i.e. generally, those Soldiers assigned to Army

[254] Ibid. The specific correspondence is the non-final rejection with a mail room date of January 21, 2010.

[255] Ulysses John Biffoni, electronic mail interview by author, May 20, 2016. *See* Appendix E. Additionally, simple internet searches for a respective patent attorney's name and a corresponding research organization may indicate the linkage between an attorney and a research organization, though such linkages are not relied on herein.

Forces Command, an Army Service Component Command, or one of the Reserve Components) if there was no collaboration with an Army research organization required. In other words, if a Soldier invents a device without support from AMC, it is assumed that the patent would be prosecuted by a patent attorney from USALSA.

Occasionally, as shown in Appendices A through C, a private law firm prosecutes patents issued to the Army. As such, a linkage to the prosecuting organization could not be done merely by identifying the prosecuting attorney. A search through such a patent's prosecution history in PAIR often unearthed a correlation with one of the organizations at some point during the prosecution history. Once an organization was identified, said patent was linked to said organization.

For CY 2013 through 2015, there were five patents that did not reveal any connection with a research organization even after an in-depth review as discussed above. An example of such is U.S. Patent 8,354,390 to Bavari et al.; an invention concerning the Ebola virus. For all five of these patents, based on a brief review of them, it is highly unlikely that a Soldier was involved in the inventorship of these patents as described in greater detail below.

Table 12 lists the attorneys that can be associated with a respective research organization from the patents issued between CY 2013 through 2015. The Army research organizations are the Aviation and Missile Command (AAMC), ARDEC, ARL, CECOM, ECBC, MRMC, NSRDEC, Space and Missile Defense Command (SMDC), TACOM, USACE, and USALSA. [256]

[256] The organizations of TACOM and the Tank Automotive Research, Development and Engineering Center, due to their overlapping functions, are used

Table 12. Patent Attorney by Research Organization for Patents issued between CY 2013 and CY 2015

| Organization | Attorneys | | | | |
|---|---|---|---|---|---|
| AAMC | William B. Hammond | Michael K. Gray | | | |
| ARDEC | Henry S. Goldfine | Michael C. Sachs | John DiScala | | |
| ARL | Alan L. Kalb | Eric B. Compton | Christos S. Kyriakou | Lawrence E. Anderson | Guy M. Miller |
| | Robert Thompson | Freda Krosnick | Avrom David Spevack | John H. Raubitschek | Richard Morgan |
| CECOM | Azza Jayaprakash | Richard J. Kim | Stephen J. Harbulak | | |
| ECBC | Ulysses J. Biffoni | | | | |
| MRMC | Elizabeth Arwine | | | | |
| NSRDEC | Roger C. Phillips | | | | |
| SMDC | C. Joan Gilsdorf | | | | |
| TACOM | Luis M. Acosta | David Kuhn | Thomas Saur | | |
| USACE | Brian G. Jones | | | | |
| USALSA | Kristen Kohler | | | | |

*Source*: Created by author after analyzing various patents in PAIR (http://portal.uspto.gov /pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

It is clear from Table 12 that there is a greater need in some research organizations relative to others for patent attorneys. ARL has nine patent attorneys while ECBC has one. One would expect that ARL prosecutes more patents than ECBC based

interchangeably throughout this paper. This paper does not attempt to distinguish between these two organizations. Similarly, the Engineering Research and Development Center is not distinguished from USACE; additionally, CECOM and the Communications-Electronics Research, Development and Engineering Center are also not distinguished from each other.

on this fact. Tables 13, 14, and 15 identify the number of patents issued to the Army as prosecuted by each respective research organization in CY 2013, CY 2014, and CY 2015 respectively. One may then deduce that the inventors are either employees of the respective research organization, or that the inventors are Soldiers that collaborated with the respective organizations.

Table 13. Patents Issued per Organization (CY 2013)[257]

| Research Org. | # of Issued Patents | | Research Org. | # of Issued Patents |
|---|---|---|---|---|
| AAMC | 5 | | SMDC | 1 |
| ARDEC | 43 | | TACOM | 6 |
| ARL | 38 | | USACE | 1 |
| CECOM | 22 | | USALSA[258] | 1 |
| ECBC | 21 | | Unknown[259] | 1 |
| MRMC | 14 | | Total | 160 |
| NSRDEC | 7 | | | |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/ netahtml/PTO/index.html ) and PAIR (http:// portal.uspto.gov/pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

[257] Some of the patents assigned to an organization were not necessarily prosecuted by that particular organization; instead, these patents were prosecuted by a private law firm though at some point in the patent prosecution process, as evinced by the patent application file, the respective organization was involved. An example of such is U.S. Patent 8,580,350 to Choi et al.

[258] U.S. Army Legal Services Agency, "USALSA- About us," accessed May 3, 2016, https://www.jagcnet.army.mil/usalsa. For ease of discussion, USALSA is listed in tables 13 through 15 as a research organization. In fact, USALSA is the agency that supports the Judge Advocate General by, among other things, providing "subject matter expertise and advice. . . in Intellectual Property Law. . . to all assigned elements."

[259] The unknown patent is U.S. Patent 8,354,390 to Bavari et al., "Compositions and methods for inhibiting expression of a gene from the Ebola virus." This patent involves the Ebola virus. As such, it is reasonable to assume that a Soldier in the field is not one of the patent's named inventors.

Table 14. Patents Issued per Organization (CY 2014)[260]

| Research Org. | # of Issued Patents | | Research Org. | # of Issued Patents |
|---|---|---|---|---|
| AAMC | 6 | | SMDC | 1 |
| ARDEC | 42 | | TACOM | 12 |
| ARL | 39 | | USACE | 2 |
| CECOM | 18 | | USALSA | 0 |
| ECBC | 14 | | Unknown[261] | 2 |
| MRMC | 20 | | Total | 160 |
| NSRDEC | 4 | | | |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/netahtml/PTO/index.html) and PAIR (http://portal.uspto.gov/pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

[260] Some of the patents assigned to an organization were not necessarily prosecuted by that particular organization; instead, these patents were prosecuted by a private law firm though at some point in the patent prosecution process, as evinced by the patent application file, the respective organization was involved. An example of such is U.S. Patent 8,810,996 to Lee.

[261] The unknown patents are: U.S. Patent 8,735,369 to Bavari et al., (‘369) “Compositions and methods for inhibiting expression of a gene from the Ebola virus;” and 8,785,547 to Palmese et al., (‘547) “Toughening cross-linked thermosets.” It is worth observing that one of these patents (‘369) involves the Ebola virus. The other patent (‘547) involves a grafted triglyceride. It is reasonable to assume that neither of these two patents were invented by Soldiers.

Table 15. Patents Issued per Organization (CY 2015)[262]

| Research Org. | # of Issued Patents | | Research Org. | # of Issued Patents |
|---|---|---|---|---|
| AAMC | 4 | | SMDC | 1 |
| ARDEC | 43 | | TACOM | 3 |
| ARL | 54 | | USACE | 1 |
| CECOM | 16 | | USALSA | 0 |
| ECBC | 20 | | Unknown[263] | 2 |
| MRMC | 12 | | Total | 169 |
| NSRDEC | 13 | | | |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/ netahtml/PTO/index.html) and PAIR (http://portal.uspto.gov/ pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

Most of the organizations shown in Tables 13 through 15 can be grouped into a higher organization such as AMC. Table 16 reflects the total number of issued patents to each major command or organization between CY 2013 and 2015. Additionally, table 16 shows the overall percentage of the Army's issued patents that each organization prosecuted from CY 2013 through 2015.

[262] Some of the patents assigned to an organization were not necessarily prosecuted by that particular organization; instead, these patents were prosecuted by a private law firm though at some point in the patent prosecution process, as evinced by the patent application file, the respective organization was involved. An example of such is U.S. Patent 9,156,945 to Watterson et al.

[263] The unknown patents are: 9,102,807 to Palmese et al., ('807) "Toughening cross-linked thermosets;" and 9,097,713 to Dye et al., ('713) "Monoclonal antibodies against glycoprotein of Ebola sudan boniface virus." It is worth observing one of these patents involves the Ebola virus. The other one involves a grafted triglyceride. It is reasonable to assume that neither of these two patents were invented by Soldiers.

Table 16. Summary of Patents Issued per Organization (CY 2013-2015)

| Research Org. | # of Issued Patents | Percent of Issued Patents |
|---|---|---|
| AAMC | 15 | 3 |
| AMC | 415 | 85 |
| MRMC | 46 | 9.4 |
| SMDC | 3 | 0.6 |
| USACE | 4 | 0.8 |
| USALSA | 1 | 0.2 |
| Unknown | 5 | 1 |
| Total | 489 | 100 |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/ netahtml/PTO/index.html) and PAIR (http://portal.uspto.gov/ pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

The patents issued to AAMC, MRMC, SMDC, and USACE were not explored further to determine whether Soldiers were named inventors of those patents for a few reasons. First, the data sample is small, particularly for USACE and SMDC. Its results, though interesting, would do little to represent the current state of the entire Army's pursuit of patents. Furthermore, most importantly, the level of technology specified in these patents is so sophisticated that it is difficult to imagine a scenario of a Soldier in the field contributing to the inventorship of their respective patents. As an example, the titles of the four patents issued to USACE during this three year period are as follows:

1. Multilayer hydrogels with pH-responsive swelling and surface wettability

2. Configuration for improving bonding and corrosion resistance of reinforcement material;

3. Biogenic template for enhanced sorption of contaminants; and

4. Transportable modular configuration for holding panels.[264]

A review of these titles reveals a level of technology not readily available to Soldiers in the field at least with respect to the first three patents. Outside of conducting an interview with officials from each of these three organizations, there is nothing that indicates whether Soldiers were involved in the inventorship of any of these patents which amount to less than 5 percent of the Army's total number of issued patents.

MRMC patents present a similar issue as the USACE, SMDC, and AAMC patents. The following is a list of the MRMC patents issued in 2015:

1. Induction of highly specific antibodies to a hapten but not to a carrier peptide by immunization;

2. Compositions and methods for inhibiting expression of a gene from the Ebola virus;

3. Dynamic exoskeletal orthosis;

4. Ricin vaccine and methods of making thereof;

5. Method of treating organophosphorous poisoning;

6. Recombinantly expressed Plasmodium CelTOS antigen and methods of use thereof'

7. Antibodies with simultaneous subsite specificities to protein and lipid epitopes;

8. Plasmodium falciparum circumsporozoite vaccine gene optimization for soluble protein expression;

9. Combinations of gene deletions for live attenuated Shigella vaccine strains;

10. Collection and analysis of vital signs;

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[264] *See* Appendices A through C for patents with USACE as the research organization. This information was obtained by the author after analyzing the Army's patents for calendar years 2013 through 2015 and organizing the patents by the prosecuting research organization. The process of organizing by research organization is described *supra*.

11. Device and method for inducing brain injury in animal test subjects; and

12. Cleavage sensitive antibodies and methods of use thereof.[265]

Most of these 2015 patents involve a vaccine or antibody; hardly a patent conceived of by Soldiers in the field. The eleventh patent prompted further inquiry only to realize that the patent concerned an algorithm and "multiple constant-frequency row vectors."[266] Accordingly, the 2013-2015 patents issued to AAMC, MRMC, SMDC, and USACE are generally not indicative of a Soldier's propensity to develop a patentable innovation. Certainly, there may be an outlier embedded within these patents, but such an outlier is of little help in support of this research.

The patents of great interest were those issued to AMC. Accordingly, an interview through electronic mail was conducted with two AMC patent attorneys. First, ECBC patent attorney John Ulysses Biffoni, whose CY 2015 patents were explored above, provided insight into the extent of Soldier inventorship in one of AMC's research organizations. Attorney Biffoni notes "very few cases"[267] of patents with Soldiers as

[265] *See* Appendix C. This information was obtained by the author after analyzing the Army's patents for calendar years 2013 through 2015 and organizing the patents by the prosecuting research organization. The process of organizing by research organization is described *supra*.

[266] Jacques Reifman et al., "Collection and Analysis of Vital Signs," U.S. Patent No. 8,977,349, Alexandria, VA: U.S. Patent and Trademark Office, March 10, 2015.

[267] Biffoni, interview.

named inventors in 22 years.[268] Specific to ECBC's CY 2015 patents, attorney Biffoni states that none of these patents had Soldiers as named inventors.[269]

Second, Intellectual Property Counsel for Headquarters, AMC, patent attorney George Winborne, provided general insight into the extent that Soldiers are involved in the inventorship of AMC's patents.[270] To be clear, notwithstanding the patents of AAMC, MRMC, SMDC, and USACE, AMC's patents are the primary source of the Army's patents.[271] Accordingly, Attorney Winborne states that in recent years there are no Soldiers among the named inventors of AMC's patents.[272] For clarification, there are two eras of patents that attorney Winborne describes. The first era includes patent applications *filed* in CY 2013 through 2015. This data set is presumably larger than the data set explored in tables 13 through 16 above because the latter data set accounts only for applications for patents that were *issued* in those years.[273] As noted earlier, patent pendency averages 26 months. As such, the first era's patents, on average, so long as their applications actually claim patentable inventions, would be issued between CY 2015

[268] Biffoni, Interview.

[269] Ibid.

[270] George O. Winborne, electronic mail interview by author, May 22, 2016. *See* Appendix D.

[271] As reflected in table 15 above, AMC's research organizations account for 85 percent of the Army's patents. The remaining 15 percent of the Army's patents generally deal with highly sophisticated technologies (e.g. vaccines and biogenic templates, to name a few) that in all likelihood were not the fruits of Soldier-ingenuity.

[272] Winborne, Interview.

[273] Tables 13 through 16 include only issued patents. That is, patent applications that upon review by the USPTO, were deemed to comprise patentable inventions.

and 2017. The patents explored in tables 13 through 16 above were, on average, filed in CY 2011 through 2014, thereby defining a second era of patents. To be clear, the first era involves patents filed between CY 2013 through 2015 and the second era involves patents filed between CY 2011 and 2014. There is some overlap between the two eras, but attorney Winborne observes a common theme among both eras: Soldiers are not among the Army's patents' named inventors.[274]

Table 16 reveals that USALSA attorneys prosecuted one of the 489 patents issued to the Army from 2013 through 2015.[275] It would seem that this patent stands a good chance of having its inventorship rooted in the field. However, an internet search of the sole inventor for this patent reveals that he, as of 2005, was a highly educated member of the faculty at USMA.[276]

Accordingly, this research of patents issued between 2013 and 2015, along with those filed between these same years, reveals a nearly total absence of Soldier-inventors. History shows that Soldiers can invent; USMA cadets are inventing; the question is obvious: why are Soldier's inventions not maturing into patents? The answer is not obvious. However, the remainder of this chapter probes the Army's regulations that guide Soldier-inventors, the Army's cultural dimensions, and the benefits of pursuing patents.

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[274] Winborne, Interview.

[275] *See* Michael A. Butkus, "Adaptable Water Harvesting Apparatus," U.S. Patent No. 8,584,480, Alexandria, VA: U.S. Patent and Trademark Office, November 19, 2013.

[276] Jeffrey A. Starke et al., "Do Iodine Water Purification Tablets Provide an Effective Barrier against Cryptosporidium parvum," *Military Medicine* 170 (January 2005), accessed May 9, 2016, http://publications.amsus.org/doi/pdf/10.7205/MILMED.170.1.83.

This probing may provide insight into some enablers and disablers of patentable innovation within the Army.

## A review of the Army Process

It is clear that, in light of several fundamental changes to patent law, the Army is due an update to AR 27-60. Most importantly, of these fundamental changes, AR 27-60 fails to account for the implementation of the first to file provisions relative to the first to invent provisions. As a brief review, inventorship is now determined based on the first inventor to file a patent application; not the first person that actually invented a device.[277] This is particularly important to the Army given the lengthy rights determination process as explained in chapter 2 and the demonstration-events that many Soldiers engage in.

Although AR 27-60 purports to set forth two mutually exclusive paths for submitting invention related documents, the paths are inextricably linked. As discussed in chapter 2, the disclosure form is *authorized* to be submitted directly to patent counsel, while the determination of rights form is *mandated* to get routed through the chain of command. For efficiency purposes, it is easy to conceive of the likelihood that leaders will consolidate both processes into the mandated process, particularly in the absence of clear guidance from AR 27-60. As such all invention-forms will be routed through the mandated process; that is, through the chain of command required of the rights-determination process.

The first step of this rights-determination process involves the disclosure of any invention on DA Form 2871-R made by a Soldier through their chain of command. Block

[277] 35 U.S.C. § 100 (note).

13 of this form advises the Soldier to briefly describe the problem solved by the invention. Block 18, as completed by the Soldier-inventor's supervisor, questions the supervisor's understanding of the Soldier's invention. There are no warnings on the form to the Soldier-inventor to refrain from disclosing any substantive details of the invention in the form. Additionally, one of the next steps of the process requires a patentability determination internal to the Army without clearly indicating how substantive details are conveyed to the determining party.

These facts regarding DA Form 2871-R enable a fact pattern for an inadvertent disclosure that may prevent a Soldier from obtaining a patent. For example, the disclosure could trigger the one-year statutory bar clock or may enable someone else to assert their wrongful inventorship regarding this patent. This form, could easily end up in someone else's hands, other than the supervisor. As such, the public disclosure status of the invention may be earlier than the inventor's desires. This is not to assume a parade of horribles; it is to assume reality of non-confidential information that is submitted through a chain of command.

Furthermore, the act of the Soldier awaiting their supervisor to complete the form will consume time. A competent supervisor is expected to seek advice on how to fill out the form since the content of the form is probably foreign to the supervisor. This further delays the execution of the form that is the first step of the Army's patent application process.

It is interesting to note that the regulation expressly states "all inventions" [278] must be disclosed through a Soldier's chain of command. This is of particular interest to Reserve and National Guard Soldiers. These Soldiers often have a profession wholly separate from their military obligations. It begs the question of competing interests for a Soldier-inventor employed by a company as to whether this product must be disclosed to both the Soldier's employing company and the Army.

It is clear upon an analysis of the first step of the Army's patent application process, that the process is flawed from the outset. There is a predictable, and possibly substantial, elapse of time that surely further delays the filing of any patent application. The process also lends the inventor liable to an inadvertent disclosure. This elapse of time is in a context where time is truly of the essence.

The next step involves an analysis of the patentability of the invention. As best understood, there are two patent attorneys that are employed by the Army that are suited to make this determination.[279] There are not two patent attorneys per combatant command; there are two patent attorneys, exclusive of the research organizations described above, that are suited to evaluate the patentability for any inventions of the Army's nearly one-million Soldiers.[280]

Once the Army adjudicates the merits of an invention's patentability, the determination is made by IPCA as to whether the Soldier or the government owns the

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[278] Department of the Army, Army Regulation 27-60, *Intellectual Property,* 4.

[279] This understanding is based off of phone calls seeking contact with the IPSA.

[280] The Heritage Foundation, "2016 Index of Military Strength," accessed May 4, 2016, http://index.heritage.org/military/2016/assessments/us-military-power/us-army./

rights to the invention. If the Soldier-inventor disagrees with the determination, the Soldier appeals through the Department of Commerce. Specifically, the appeal is filed with a position that does not appear to exist: the USCT. An internet search does not clearly indicate who this person is. This position, at least as of 2001, was identified as the fifth highest ranking member of the Department of Commerce.[281] As best understood, this position, the fifth position listed on the Department of Commerce's leadership page, is now named the Under Secretary for Standards and Technology, Director of the National Institute for Standards and Technology.[282]

It is surprising that a Soldier's initial disagreement with the Army's assessment of whether the Soldier owns the rights to the invention, or the government does, ends up before an official not far removed from an Executive Cabinet Position, namely the Secretary of Commerce.

Once these hurdles are overcome, the marketability of the proposed and alleged patentable innovation is scrutinized. The patent application will not be filed until an Army activity asserts that there is a use for the innovation by said army activity or the invention has commercial potential. The biggest challenge here appears to lie in the act of soliciting an Army activity to vouch for an invention's usefulness. The USPTO's standard for usefulness is low as indicated in chapter 2. As such, these hurdles may be

[281] The White House, "Executive Order on Succession at the Department of Commerce," December 28, 2001, accessed May 2, 2016, http://georgewbush-whitehouse.archives.gov/news/releases/2001/12/20011229-3.html.

[282] Department of Commerce, "Dr. Willie E. May, Under Secretary for Standards and Technology and NIST Director," accessed May 2, 2016, https://www.commerce.gov/directory/willieemay.

referred to as marketing hurdles. They appear to exist, perhaps for good reason, in the interest of avoiding the expense of tax payer funds on Soldier-inventions that lack an Army activity's voucher for its usefulness. Once these marketing hurdles are overcome, the finish line at the USPTO, which is really the starting line for the official patent application process comes into focus.

Much of the army's patent application process is consumed by a determination into what entity owns the rights to the prospective invention. If the Soldier-inventor initially agrees to assign all rights and interests in the invention to the government, the hurdles that remain are an initial patentability determination as well as the afore-mentioned marketing hurdles. As such, the process clearly incentivizes a Soldier to assign all rights of their invention to the government. To be clear, the focus of this research is on Soldier-inventions that are, in fact, owned by the government. This sidebar discussion is advanced merely to highlight some challenges of AR 27-60.

In summary, the patent application regulations described in AR 27-60 are impracticable and militate away from fostering patentable innovation. Some of this is attributed to the Army's cultural dimensions and a realistic understanding of the makeup of the Army's force.[283] Some of this is due to ambiguity in AR 27-60 as to the process of submitting invention related forms. Moreover, some of the issues with AR 27-60 stems from the Army failing to keep its regulations current with major fundamental shifts in patent law and policy.

[283] That is, much of the Army's force comprises Reservists and National Guard forces. As such, the determination of rights process for these Soldiers is impracticable in that it requires every invention to be disclosed to the Army.

## The Army's Cultural Dimensions

The Army's cultural dimensions as they relate to capturing patentable innovations are best synthesized through an understanding of a trilogy of patentable innovation. The trilogy comprises cultural enablers, cultural disablers, and attitudes to innovate. The first leg of the trilogy is the cultural enablers. The Army's culture is complex. Any attempt to establish an exhaustive list of cultural dimensions that spans the spectrum of the Army, in really any context, will surely be futile. There are simply too many subcultures.[284] The dimensions of those in the 82nd Airborne Division will differ from those in CECOM. The dimensions of the attorneys in the Judge Advocate Corps differ from the pilots in the Aviation Branch. The dimensions of Soldiers honored with donning a Ranger tab are different than those honored with wearing the Master Recruiting Badge. Though these subcultures vary widely, there a few enablers well suited to fostering patentable innovation, that in fact, straddle across these varied subcultures.

The two main cultural enablers for fostering patentable innovation is the philosophy of mission command and the Army's enduring quests for seeking problems. The principles of mission command align perfectly with known dimensions of innovative cultures. These principles were introduced in chapter 1 and are essential elements to fostering innovation. Particularly, the shared understanding principle is a key enabler. Inventions rarely happen as the result of lone-inventors. Sergeant Culin and First Lieutenant Foster invented the cutter and the shifter respectively only through their

[284] Schein, 1-2. Schein identifies various categories of culture that are not explored in this research but for the notion of subcultures existing within an organization. Schein defines subcultures as "various occupational groups that make up organizations."

collaboration with others.[285] The collaboration must break through the glass walls of the Army's subcultures. The collaboration must extend through the walls of the 82nd Airborne and into the research organizations of AMC.

A few other principles of mission command merit further attention. Mutual trust can be applied in various contexts. As explained, teams must be built that connect various organizations together. An essential element to effective teams is mutual trust; there must be a "shared confidence"[286] among Soldiers and civilians that effective and useful solutions to problems are sought and aggressively thought through. This shared confidence can only be sustained through *disciplined* initiative. This principle centers upon the "creation of opportunities,"[287] or solutions, though only with the exercise of discipline in doing so. The philosophy of mission command is now well established throughout the Army's forces; it is explained to, and hopefully truly understood by, all Army leaders. This philosophy is practiced; it is now simply time to expand its application to different frontiers such as that of capturing patentable innovations.

The Army has a yearning for identifying problems. An understanding of a problem is the cornerstone of the operations process.[288] Problems surface in many other forms. They surface through after action reviews of recently completed tasks, missions,

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[285] The details regarding these inventions are disclosed in chapter 2.

[286] Department of the Army, Army Doctrine Publication 6-0, *Mission Command* (Washington, DC: Government Printing Office, 2012), 2.

[287] Ibid., 4.

[288] Department of the Army, Army Doctrine Publication 5-0, *The Operations Process* (Washington, DC: Government Printing Office, 2012), 2-3.

or exercises. The mindset of conducting these reviews is embedded in every military subculture. Problems can also be unearthed through soul searching analyses of past experiences, particularly combat experiences, that, often, only elapsed time can help unearth. Problems are like the fish in a vast ocean of past and future military experiences. The problems, like the fish, are not simply going to flop from the sea onto the deck. With the proper bait, patience, and willingness to get dirty, the catch is unlimited.

The second leg of the trilogy of patentable innovation is the disablers of such which includes the chain of command and risk averse decision making processes. Before diving into each, it is worth immediately identifying that these disablers are also hallmarks of military operations. One author succinctly identified this: "the same processes that are required to make an institution function smoothly—such as hierarchy . . . and behavioral norms—are precisely those that make differentiation and varietal thinking extremely difficult to achieve."[289] The chain of command and risk aversion practices enable effective military operations but they also disable the capturing of patentable innovations.

The chain of command process established through the submission of inventions is evidence of the challenges of such. Besides being an overly burdensome process to follow, merely because of the use of the chain, it stifles thought in and of itself. As the quote indicated above, Soldiers often seek conformity, and the action of submitting an invention, or more broadly anything innovative, is the result of an inventor's refusal to accept conformity. The fact that this, the submission of patentable innovations, must be

[289] Micah Zenko, *Red Team: How to Succeed by Thinking Like the Enemy* (New York: Basic Books, 2015), 213.

conveyed through a complex chain of command process is an innovation disabler in and of itself. Robert Noyce analogized the use of a chain of command for processing innovation to a "corporate court."[290] He despised such cultural dimensions. Noyce preferred the direct connection between the inventor and those capable of enabling and facilitating the invention. The latter may be engineers within AMC, patent attorneys, or peers who may be simultaneously finding solutions themselves.

The avoidance of risk is a known disabler to not only innovation, but leadership in general. The mission command philosophy tackles this disabler with its sixth principle: accept prudent risk.[291] Accordingly, Army leadership expresses a willingness for Soldiers to accept risk so long as the mission is still accomplished. However, the underlying assumption of avoiding risk appears to be more deeply rooted than simply having top Army leadership militate against it. Strategist Pierre Chao captured it. He noted that there seems to be an assumption that taxpayers do not want the military to accept prudent risk.[292] This is particularly problematic to justify the spending of nearly $3,000 for a patent application that matures into a patent, when its usefulness may not be unanimously agreed upon at the time such accounting becomes public. This is the issue of risk aversion most applicable to this research: can the military justify, and can the taxpayer accept, such expense; such a "deliberate exposure to potential . . . loss . . . as worth the cost."[293]

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[290] Isaacson, *The Innovators*, 193.

[291] Department of the Army, Army Doctrine Publication 6-0, 5.

[292] Chao, 111.

[293] Department of the Army, Army Doctrine Publication 6-0, 5.

The third leg of the trilogy of understanding the Army's culture for fostering patentable innovations is attitude. The Army's culture is what it is. Leaders can exercise the framework espoused by Edgar Schein, by uprooting flawed underlying assumptions to change it. Or, as discussed in chapter 2, it can be merely a matter of perspective as Dr. Hill explains. As Hill suggests, it is about engineering an innovative attitude.[294] The research in chapter 2 indicates a series of cultural dimensions rooted in military culture juxtaposed, as shown in figure 4, with those aspired cultural dimensions. While the upper right quadrant of figure 4 has the hallmarks of an innovative culture (as literally expressed in table 6), one must set realistic expectations of whether it is possible to shift the polygon to the upper right.

Instead of trying to change the Army's dimensions and move them to the upper right, it is merely about engineering those dimensions that are currently rooted into the Army's culture. It is about exploiting those dimensions that may be perceived to be disablers, and make them enablers. Tables 7 and 8 in chapter 2 provide clear examples of such engineering. The bottom half of the quadrant from table 4, which the survey showed leaders wish to move away from (that is, move more into the upper half of the quadrant), comprises dimensions of innovative cultures if these dimensions are appreciated and exploited. These dimensions of tough, demanding, and competitive leaders along with efficiency-focused and results oriented organizations are not dimensions the Army should move away from. Although these dimensions can be viewed as anti-innovation from one perspective, another perspective can view them as innovation enablers and exploit them.

[294] Hill, "Military Innovation," 95.

It is all about engineering an innovative culture, not through uprooting underlying assumptions, but by engineering them to foster innovation.

## Benefits of Patentable Innovations

There are few, clear, uncontroverted correlations between an organization's pursuit of patents and the benefits obtained by such. The pursuit of patents advances both tangible and intangible benefits. Author Robert Hahn, as noted in chapter 2, asserts some interesting points worth exploring in this chapter. While some are directly tied to the benefits of pursuing patents, some are advanced to better enable an organization to assess its pursuit of patents (e.g. the concept of data collection discussed below).

First, Hahn noted that the greater the number of patents, the greater the opportunity for licensing.[295] This is a logical relationship but it should not be taken for granted. There is a level of quality of patents that must be appreciated and proven in order for this relationship to continue. If the patents issued to an organization are of poor quality, for example the patents are for a product that is not useful, their opportunity for licensing is less. The focus of patentable innovations should be on solving problems; not on merely obtaining a patent. The greater the focus on the former, the greater the likelihood of more useful patents.

One of the army's cultural enablers of patentable innovation is its quest for unearthing problems. This brings with it some optimism in this area of obtaining useful patents. Soldiers identify a problem with their equipment; they collaborate to solve the problem, and they obtain a patent for their patentable innovation. At this point, the Army

[295] Hahn, *Economics of Patent Protection*, 2.

merely has a right to exclude others from making or using a product that solves Soldiers' problems. This right in and of itself is of little benefit; however, an astute businessman should recognize that Soldiers developed a solution to a problem they encounter but they lack the means of manufacturing the product.

Accordingly, there would be at least one market for such a product: Soldiers. This is an opportunity for the Army to license such a patent with the expectation that such licensure would, at minimum, overcome all expenses incurred in obtaining and maintaining the patent.[296] At maximum, perhaps the profits for such licensure can surpass any of the expenses incurred and the Army may realize a net gain. Unfortunately, statistics indicate this approach of identifying a problem, collaborating to solve it, obtaining a patent, licensing the patent, and realizing a profit may be too idealistic.[297] In any event, this approach is an opportunity that, at worst case, solves problems, and, at best case, also generates profits for the Army.

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[296] Headquarters, Department of the Army, Army Regulation (AR) 27-60, *Intellectual Property* (Washington, DC: Government Printing Office, 1 June 1993), 11. Although not mentioned here in chapter 2 due to its brevity of discussion in AR 27-60, the regulation authorizes such licensing occurrences. These "inventions may have commercial potential and should be made available to the private sector under a patent license agreement [among other legal mechanisms for technology transfer]." It is interesting to note the regulation in earlier sections as explored in this paper does not authorize pursuing patentable innovations that are not deemed to have commercial potential. Perhaps it is contemplated that the passage of time, subsequent to patent filing, may prove fatal to any once found commercial potential.

[297] Alexander Poltorak and Paul Lerner, *Essentials of Intellectual Property*: *Law, Economics, and Strategy* (Hoboken, NJ: John Wiley and Sons, 2011), 90. In *Essentials of Intellectual Property*, the authors point out that one in 20 patents are licensed and one in 100 generate royalties. The data set for this survey was not provided so it is difficult to accurately extend these statistics to any specific organization, such as the Army. The statistics do indicate that the mere act of obtaining a patent in no way assures the formation of a license, let alone profits from such.

Licensing not only can generate profits for the Army, but it can also provide opportunities to incentivize the Soldier-inventors. ARs and Federal law provide the authority for issuing cash payments to Soldiers in congruence with the value of the negotiated license.[298] It is worth observing that the negotiation of licenses could get thorny as the inventors may disagree with the Army's negotiating strategy. Surely, especially in cases with many inventors for a single patent, it will be difficult for a negotiated outcome to appease each of the inventors equally. Nevertheless, the authority appears to exist to support incentivizing a Soldier's patentable innovation with cash awards in congruence with the actual profit for a negotiated license.

Another one of Hahn's assertions centers on data collection.[299] His emphasis as to the importance of data collection is particularly applicable to this research. The Army simply does not collect data on the inventorship of its patents. As this research indicates, the only way to attempt to verify the status of named inventors is to vet each Army organization or command that files patent applications. A system that better tracks the demographics of inventors may enable accurate assessments of the benefits of Soldiers' pursuit of patents.

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[298] 15 U.S.C. § 3710c; 15 U.S.C. § 3703; Headquarters, Department of the Army, Army Regulation (AR) 672-20, *Incentive Awards* (Washington, DC: Government Printing Office, 1 April 2014), 11. 15 U.S.C. § 3710c provides for an inventor receiving "at least 15 percent" of profits generated from licenses. The trigger for this statute however is the involvement of a "Federal laboratory" which is defined generally as a "federally funded research and development center" or laboratory "owned, leased, or otherwise used by a Federal agency and funded by the Federal Government." *See* 15 U.S.C. § 3703. Additionally, AR 672-20, Figure 7-1, provides a table with cash awards that correspond with the tangible benefits to the Army. For example, a tangible benefit to the Army of $25,000 yields a cash award of $1,450.

[299] Hahn, *Economics of Patent Protection*, 42

One of Hahn's recommendations was for an organization's policies to not lag far behind the federal government's patent policies.[300] Patent law has been riddled with change in the past decade. One of the many changes is the shift from first to invent to first to file. This shift imposes significant procedural issues in how the Army should be managing its patent application process, and other affairs related to patentable innovations. However, the army has not kept up with the changes in patent law and policy, as AR 27-60 is awaiting its first update in almost a quarter of a century.

The research in chapter 2 yields the fact that patents are pursued for reasons beyond making profits. These intangible benefits of pursuing patents particular to the Army are plentiful. First, patents are solving problems encountered by Soldiers. There are additional steps that must be effectuated to implement the solution to the force, but patents provide an effective launchpad to effectuate such.

Second, the Army can boost its recruiting efforts through marketing its Soldier-inventors. The facts indicate a perception that the Army is uneducated, not forward thinking, lacks unique job responsibilities, and lacks training in cutting edge technology (as shown in chapter 2, figure 5). A Soldier's pursuit of patents can boost each of these unfavorable perceptions. The mere association of patent statistics with Soldiers, similar to Audi's use of its patent statistics as discussed in chapter 2, provides one of many possibilities to remove the uneducated stigma associated with the Army. A Soldier's pursuit of patents provides opportunities for collaboration with the Army's research

[300] Ibid.

organizations. These opportunities can expose Soldiers to cutting edge technologies and evince that the Army is in fact, forward thinking.

Of course, a Soldier's pursuit of patents is not a solution to the above unfavorable perceptions. However, there is no single solution. The only way to counter these perceptions is through a series of incremental efforts that when combined together provide opportunities for growth. A Soldier's pursuit of patents is such an incremental effort that enable a more favorable reputation for the Army in certain areas which serves as aid for recruiting efforts.

Third, it is acknowledged that patents do not necessarily stimulate a culture's propensity to innovate. However, it is equally acknowledged that patents do not harm such. As acknowledged by some organizations, as shown in chapter 2 (figure 8), albeit not a large amount, patents provide an opportunity to measure innovation. Patents provide an objective means for assessing an organization's propensity to innovate.

Assessments may be reached of one organization's propensity to innovate compared to another through tracking patent filing or issuance statistics. For example, it would be a telling statistic if the 82nd Airborne Division had several Soldiers in its ranks that were named inventors on patent applications while a peer Division had none. In the alternative, if one State's National Guard had several named inventors on patent applications in its ranks while another State, with a larger National Guard population, had none. It is important to balance such competition however with appreciation of the "garbage in equals garbage out"[301] principle. That is, more patents do not necessarily

[301] Hahn, *Economics of Patent Protection*, Executive Summary.

translate to higher quality patents. Accordingly, another intangible result of pursuing patents is that of providing a means for tracking the propensity to innovate.

In summary, there are both tangible and intangible benefits to a well-managed system that fosters a Soldier's pursuit of patents. The tangible benefits include the opportunity to generate profits both for the Army as a whole, and for the Soldier as an inventor. The intangible benefits mirror many of those in the private sector: namely, a more favorable reputation, and a means to track and monitor innovation. Most importantly though, patents provide an opportunity to solve problems that fosters greater collaboration across disparate organizations within the Army and also provides opportunities to stimulate innovative thinking throughout the organization.

# CHAPTER 5

## CONCLUSIONS AND RECOMMENDATIONS

Here lie the bones of Lieutenant Jones,
A graduate of this institution,
He died on the night of his very first fight,
While using the school solution.

— Epitaph on a tombstone in a mock cemetery
at the U.S. Army Infantry School.[†]

The purpose of this research was to gain an understanding of the Army's operating environment with respect to its Soldier's pursuit of patentable innovations. More specifically, the purpose was to explore whether the Army's regulations and culture adequately fosters a Soldier's pursuit of patentable innovations. The secondary issues to this understanding involved a review of applicable regulations, a review of the impact of culture on innovation, an overview of the benefits of an organization's pursuit of patents, and lastly, an analysis of past and current accounts of Army inventions and patents.

The current body of knowledge regarding most of the topics above is vast, complex, and sometimes conflicting. Accordingly, these topics were narrowly tailored to those issues most pertinent and relevant from the perspective of the Soldier-inventor. As such, details regarding technology transfer, licensing, and economic theories were minimally discussed. Such brief discussion in no way indicates their level of importance. In fact, as author Robert Hahn indicates, patents drive technology transfer so there is an

[†] Michael Doubler, *Closing with the Enemy* (Lawrence, KS: University Press of Kansas, 1994), 265.

interdependent relationship between the two.[302] However, the Sergeant Culin's and Lieutenant Foster's of the Army's force will invent regardless of what the implications are for technology transfer and economic theories.

## Regulations

Patent law is a relatively fluid area of the law. Changes occur frequently. In fact, during the authorship of Chapter 4 of this research, the USPTO issued guidance as to what constitutes eligible subject matter for patents.[303] This guidance is concerning a level of technology that is probably beyond that which is accessible to the average Soldier, but it proves that patent law is a fluid area of the law. As such, the Army's regulations that stem from it should be nearly as fluid. Certainly, there need not be an Army regulation update for every shift in patent law, but the absence of an update in nearly 25 years is perplexing.

The regulations require too much integration of the chain of command into the innovation process. It is difficult to separate such a fundamental hallmark of military operations, as the chain of command is, but the giants of innovation frequently detest its role in any process involving innovation. The chain can be incorporated at some point in the process, but its use at the outset of innovation is highly problematic for many of the reasons espoused by innovator Robert Noyce as discussed in previous chapters.

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[302] Hahn, The Economics of Patent Protection, 26.

[303] Barnes and Thornburg, LLP, "USPTO Updates Secion 101 Guidance Again," *The National Review,* May 11, 2016, accessed May 12, 2016, http://www.natlawreview.com/article/uspto-updates-section-101-guidance-again

One may argue that stability within the regulations is desired; it is indeed a favorable characteristic but stability is trumped by workability and relevance. The regulation is a burdensome and intimidating roadmap for a Soldier-inventor to follow before a patent application is even drafted. This is particularly so, if the Soldier asserts that they should own the invention as opposed to the government based on the criteria set forth in the regulation.

There must also be a more reasonable standard particularly for the Reserve and National Guard forces. Such forces should not be mandated by regulation to disclose all of their inventions if they are clearly associated with their non-military employment. A line should be delineated that, at minimum, distinguishes inventions made with a non-military employer and those made with the military. This line may comprise a simple notification to the Army that a patent application was filed with the Soldier's non-military employer. Most patent applications are public knowledge so such disclosure usually will not violate a non-military employer's confidences. Accordingly, if the Army suspects that it may have an ownership interest in the patent, then it can initiate proceedings to investigate such.

The regulations can be of greater value to the Army in a few other ways. First, the Manual of Patent Examining Procedure contains many examples of inventions that the patent office determined to not be patentable particularly because the invention was merely an obvious improvement. For expectation management purposes, it would be helpful for Soldiers to compare their inventions with some of those that the courts have ruled to not be patent-worthy. This could set expectations for Soldiers in a manner that will reduce their level of anxiety and frustration when a patent attorney advises the

Soldier that their invention is not patentable. Second, the regulation can reference all of the Army's laboratories along with their general focus areas so Soldiers can submit their ideas to targeted research organizations.

Third, the issue of inventorship should be made clear. Does the act of merely submitting an idea to a research organization without conducting any follow-up demonstrations or experiments constitute an acknowledgement on the inventorship roll? Probably not. It would be helpful for Soldiers to see examples of the level of contribution that an inventor should make to qualify as a named inventor.

Fourth, the position of the Army's licensing officials should be stated to avoid any confusion as to whose interests these officials represent during licensing negotiation practices. This is particularly suitable in cases where there are joint inventors. In general, these recommendations are made with a focus on the Soldier's pursuit of a patent.[304] If the regulation is built with the Soldier-inventor in full view, most of the issues that the Soldier-inventor encounters along their march down the patent prosecution avenue should be addressed.[305]

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[304] Department of the Army, DA Pamphlet 27-11, *Army Patents* (Washington, DC: Government Printing Office, 1979). This outdated pamphlet serves as an excellent source of literature from which to build upon, or update. Its relevance and importance is questioned however due to a single citation of it in AR 27-60 and no mention of it in AR 672-20. It is also understood that Department of the Army Pamphlets serve as an instructional publication and how-to manual compared to Army Regulations. Regulations serve as a means of establishing procedures, responsibilities, and, among other things, objectives. *See* Army Publishing Directorate, *Publications 101 Course Slides*, 21 September 2015, accessed May 8, 2016, http://www.apd.army.mil/Tools/PubsResources.aspx.

[305] As an additional example, a Soldier's modification to certain equipment carries with it possible liability issues if the Soldier injures themselves or others with the modified equipment. In fact, any modifications must heed the following prescription: "Commanders will not allow their equipment to be modified unless there is an official

## Collaboration

Collaboration between Soldier-inventors across disparate organizations is critical. There needs to be free access between the identification of problems, the Soldiers motivated to solve the problems, and the research scientists and engineers that can assist the Soldiers when necessary. For example, unit rotations through the National Training Center provide an ocean of experience to navigate. Problems can be lured in, framed appropriately and shared across the force.

The database of the Joint Lessons Learned Information System provides a useful platform to share such problems. Perhaps the problems can be assigned, and tasked for developing a solution, to certain high level organizations such as at the division or corps level. For purposes of this research, a specific category of problems, or mere needs for improvement, can focus on equipment or product shortcomings. The solutions to these kinds of problems encountered may merit the pursuit of a patent; they likewise may not. In any event, the identification of these problems are simply a starting point that may spark a solution that, in fact, warrants patent protection.

The problems should be tasked to specific organizations along with the issuance of a deadline. There are two reasons for this recommendation. First, this tasking mindset tends to institutionalize innovation. All that is recommended to institutionalize is the process of assigning problems rather than let them drift into the abyss.[306] If the seed is

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[modification work order]." *See* Headquarters, Department of the Army, Army Regulation (AR) 750-10, *Army Modification Program* (Washington, DC: Government Printing Office, 5 August 2013), 7.

[306] The author anticipates the need to defend this recommendation against conflicting recommendations of historian Williamson Murray. On the one hand Murray argues that "efforts to institutionalize innovation will inhibit rather than foster the

not planted, one cannot expect to find fruit to harvest. Accordingly, it is recommended to plant the seed by tasking the problems to one or two organizations and await the solution to harvest.

As mentioned, the opportunity to harvest should evolve from a deadline. Research shows that deadlines spur creativity, especially among those who procrastinate.[307] The research that actually promotes procrastination as an enabler of creative and innovative thinking is insightful. This research may help explain one of the Army's cultural dimensions that was noted to perplex Army leaders.[308] In any event, the two components recommended here are a tasking of a defined problem set to an organization, or multiple organizations, along with a deadline.

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process." Murray, *Innovation: Past and Future*, 326. On the other hand Murray, along with co-author Barry Watts argues that "institutional processes for exploring, testing, and refining conceptions of future war . . . are literally a *sine qua non* of successful military innovation in peacetime. Murray and Watts, *Military Innovation in Peacetime*, 410.

[307] Adam Grant, "The Surprising Habits of Original Thinkers" (video). Lecture, Technology, Entertainment, and Design (TED) 2016 (February, 2016), accessed April 12, 2016, https://www.ted.com/talks/adam_grant_the_surprising_habits_of_original_thinkers/transcript?language=en. Grant references studies that indicate that procrastination enables non-linear thought and an ability to apply different perspectives to a prescribed problem set. This is because the problem set is in the back of a thinker's mind while the thinker is performing other tasks (and, ultimately, procrastinating!). However, the essential element here is that the procrastination happens *after* understanding the problem set; not before. In other words, the act of procrastinating the understanding of the problem until just before a deadline will not be beneficial.

[308] In chapter 2, table 7, it was explained how an Army leader was perplexed that leaders chose to do tasks D, E, and F, before accomplishing the only assigned tasks of A, B, and C. The cited research tends to indicate that the rate of innovation will be less when leaders complete A, B, and C far ahead of schedule, instead of procrastinating their completion, by completing D, E, and F first. Of course, it is absolutely essential that A, B, and C are timely completed.

A step after the starting point, and naturally before the deadline, may involve the collaboration of Soldiers and scientists. One technique of fostering this collaboration is the expansion of the Army's current limited use of projects day events. It is important to caution this recommendation with the recognition that these events have pitfalls that must be understood. U.S. Patent 9,074,856 to Freitag et al. is an example of such a pitfall.[309] This patent was filed on April 17, 2014 after its provisional patent was filed on April 18, 2013.[310] A June, 2012 article mentions this invention, as deduced from a striking similarity between a drawing shown in the article (figure 10) and an illustration from the patent (figure 9). The article describes a brief history of its conception. The article identifies a disclosure of the invention at a Service Academy Design Challenge. A search for the exact dates of this Challenge reveals the dates of April 16 through April 20th.[311] The point here is that events such as projects day events that promote inventions may jeopardize the patentability of an invention. This is particularly so, when the events are combined with a burdensome and bureaucratic application process because of the one-year statutory bar (as imposed by 35 U.S.C. § 102 as explained in chapter 2). It is recommended that any participants or prospective inventors in projects day type events understand that their inventions must be filed as patent applications within one year subsequent to its disclosure.

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[309] Ryan Freitag et al., "Gun-Launched Anchor Projectile for Climbing," U.S. Patent No. 9,074,856, Alexandria, VA: U.S. Patent and Trademark Office, July 7, 2015.

[310] Ibid.

[311] Laura Dempsey, "[Air Force Research Laboratory] Design Challenge Encourages Engineering Innovation," Air Force Research Laboratory, April 30, 2012, accessed May 11, 2016 http://www.wpafb.af.mil/news/story.asp?id=123300083.

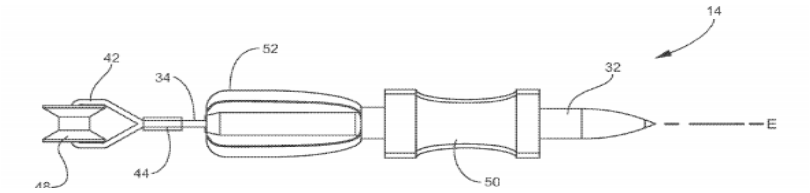


Figure 9. U.S. Patent No. 9,074,856, Figure 2

*Source:* Ryan Freitag et al., "Gun-Launched Anchor Projectile for Climbing," U.S. Patent No. 9,074,856, Alexandria, VA: U.S. Patent and Trademark Office, July 7, 2015.

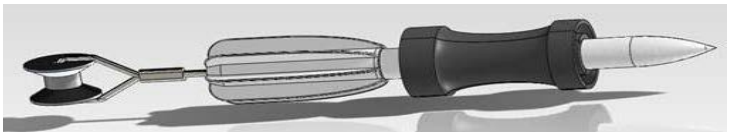

Figure 10. Illustration of the Rock-Penetrating Scaling System

*Source:* Army Research Laboratory, "ARL Mentors Help West Point Cadets Create Patent Potential Rock-Penetrating Scaling System," June 26, 2012, accessed April 14, 2016, http://www.arl.army.mil/www/?article=975.

Collaboration is also critical between prospective Soldier-inventors and the Army's patent attorneys. As table 12 in chapter 4 indicates, there are not many patent attorneys in the Army, especially when subtracting those currently assigned to AMC. [312] The Army may want to consider identifying attorneys within its Judge Advocate General corps that are currently registered patent attorneys, or that have the requisite scientific

[312] This chart in chapter 4 only captures those patent attorneys that actually prosecute patents and have prosecuted a patent to issue.

background to register as such.[313] Additionally, non-attorney Soldiers with the requisite scientific background should be identified as they may serve the Army as patent agents. These agents can assist the attorneys in the evaluation of an invention's patentability.

Lastly, with respect to collaboration, the mission command principle of creating a shared understanding is implicated. However, it is noted, at least with respect to AMC patents, that the spirit of this principle is not entirely adhered to. Specifically, patent rules generally require the publication of patent applications unless an affirmative action is taken that blocks such publication.[314] It is observed that many of AMCs patent applications are requested to be an exception to this publication rule as their applications are often not published. Perhaps there is a sound justification for this affirmative action, but if this practice is extended to patent applications with Soldiers as named inventors, such would not enable a shared understanding until years after the actual problem is solved.[315]

## Inventor Tracking

The most surprising finding of this research was that the Army simply does not track the extent that its Soldiers are pursuing patentable innovations. It is a well known

[313] The USPTO establishes criteria that an attorney's educational background must meet in order for the attorney to qualify for an exam, that when passed, enables the attorney to prosecute patents.

[314] 37 C.F.R. § 1.211.

[315] As discussed in chapter 2, the average patent pendency is about two years. That is, about two years elapse between the time of filing a patent application to the time of issuance.

axiom that “An organization does well only those things the [b]oss checks."[316] A Soldier’s pursuit of patents is not checked. Accordingly, in applying General Clarke’s axiom, Soldiers are not adequately pursuing patentable innovations. It is difficult to track anything a Soldier does when a Soldier bypasses a chain of command and collaborates across disparate organizations. However, these are recommended requirements for fostering the development of patentable innovations. The tracking may still be reconciled at the point of filing a patent application. It is recommended that there be a database that monitors all of the patent applications filed on behalf of the Army along with relevant demographical information such as whether a named inventor is a Soldier, scientist, cadet, or instructor, at the time of filing. To be clear, this responsibility should not lie with AMC despite this organization’s statistics driving the majority of this portion of the research. The only reason AMC’s environment was closely reviewed was to enable an understanding of the Soldier-inventor’s environment.

## Benefits

A pursuit of patents yields opportunities for both tangible and intangible benefits. The tangible benefits include profits gained from licenses. The licenses may be viewed as the fruit of patentable innovations. Without them, the Army merely has the right to exclude others from making or using the patented product. With them, the Army can license this right to a manufacturer and distributor for a profit. Additionally, the tangible benefits extend from the Army as an organization to Soldiers as inventors.

[316] David Hackworth and Julie Sherman, *About Face: Odyssey of an American Warrior* (Riverside, NJ: Simon and Schuster, 1989), 375, citing General Bruce C. Clarke.

There are regulations that authorize a specific amount for the mere act of being a named inventor on a filed patent application.[317] There are also regulations that establish a method of awarding cash incentives to inventors congruent with the tangible benefit to the Army as an organization.[318] These benefits should be sustained. There should also be a flat-fee cash disbursement upon the licensing of a patent similar to the $200 flat fee disbursed pursuant to a filed patent application.

The benefits should also extend to the Army National Guard. Currently, under AR 672-20, these cash disbursements expressly exclude the Army National Guard. After all, Soldiers in the National Guard contribute to military innovation in a unique manner relative to their active duty peers. They complement the military culture with cultural dimensions unique to their non-military careers. This can enable a different way of viewing problems and therefore enable the formation of different perspectives or ideas as to solutions. It is unclear whether such incentives even exist for Army National Guard Soldiers. AR 135-7 "establishes a single reference for incentives within the Army National Guard and the Army Reserve"[319] yet it fails to award incentives related to scientific achievements or inventions.

The intangible benefits of pursuing patents mainly apply to boosting the Army's reputation in a few areas where its reputation can use improvement. Patent statistics can

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[317] Headquarters, Department of the Army, Army Regulation (AR) 672-20, *Incentive Awards* (Washington, DC: Government Printing Office, 1 April 2014).

[318] Ibid., 11.

[319] Headquarters, Department of the Army, Army Regulation (AR) 135-7 *Army National Guard and Army Reserve Incentive Programs* (Washington, DC: Government Printing Office, 15 April 1996), i.

be identified in commercials; stories of Soldier-inventors can be shared with the public, and perhaps there can be a greater integration of the private sector, and public, into projects day events. All of these efforts aid in bettering the Army's reputation where the Army was recently described by a top ranking official as "uneducated."[320] For example, the integration of the public into projects day events enables the Army to showcase the fruits of collaboration while also showcasing its sharpest innovating Soldiers. Any efforts that boost recruiting should be given attention. A Soldier's pursuit of patents is one such effort. In summary, the pursuit of patents provides both tangible and intangible benefits to the Army as an organization and to Soldiers as named inventors on a patent.

## Summarized Recommendations

The previous discussion contained several conclusions and recommendations embedded therein. As an aid, the following are the principle, though not the only, recommendations for fostering a Soldier's pursuit of patentable innovation:

1. The ARs should be updated timely pursuant to major shifts in patent law and policy.
2. The use of the chain of command should be eliminated to the maximum extent possible throughout the Army's patent application process, except as needed to facilitate the fourth recommendation below.

[320] Sergeant Major of the Army Daniel Dailey (speech to the Command and General Staff College, Fort Leavenworth, March 22, 2015).

3. Army leadership's emphasis on the need, and appreciation for, innovation along with innovation-fostering philosophies, such as the mission command philosophy, should be sustained throughout the force.
4. Soldier-inventions should be tracked. It is worth revisiting General Clarke's axiom: "An organization does well only those things the [b]oss checks."[321]
5. A Soldier's pursuit of patents bears tangible and intangible benefits for the inventing Soldier and the organization as a whole. Any policy or regulation changes that impact the Army's patent application process should be constructed with such in mind.

## Future Research

This research identified several areas that can be explored in greater detail for further research. First, an analysis of the Army's licensing practices and technology transfer requirements can provide insight into the characteristics of effective licenses as well the corresponding profits that licenses generate. Second, a review of the patent filing practices of private, military, and governmental organizations may provide insight to compare and contrast with each other and with the Army. A third area may comprise a survey to Soldiers with the purpose of identifying the most important factors that may inspire them to pursue patentable innovations.

[321] Hackworth and Sherman, 375.

## Closing

Another axiom is highly applicable to this research: "The best ideas come from the bottom up."[322] This research purports to indicate some reasons why the Army is not patenting its best ideas. The reasons stem from outdated regulations, incongruence between the dimensions of an innovative culture and those of the Army, and the absence of mechanisms to facilitate and track such patenting. These reasons are easy to address to thereby enable regulations and a culture that indeed fosters a Soldier's pursuit of patentable innovations.

[322] Lieutenant General Robert Brown, "The Human Dimension" (speech to the Command and General Staff College, Fort Leavenworth, September, 11, 2015).

APPENDIX A

Calendar Year 2013 Patents Issued to the U.S. Army

| | **Patent Number** | **Title** | **Attorney** | **Research Org.** |
|---|---|---|---|---|
| 1 | 8,620,093 | Method and system for image registration and change detection | Lawrence E. Anderson | ARL |
| 2 | 8,617,328 | Foamed celluloid mortar propellant increment containers | Henry S. Goldfine | ARDEC |
| 3 | 8,614,021 | Agents for enhanced charge transport across microbial membranes | Eric Brett Compton | ARL |
| 4 | 8,611,691 | Automated video data fusion method | Alan I. Kalb | ARL |
| 5 | 8,611,603 | Method and apparatus for object tracking via hyperspectral imagery | Alan I. Kalb | ARL |
| 6 | 8,611,565 | Microscale implementation of a bio-inspired acoustic localization device | Alan I. Kalb | ARL |
| 7 | 8,608,879 | Environmentally friendly flare illuminant composition | Henry S. Goldfine | ARDEC |
| 8 | 8,607,702 | Low energy ignition system for large and medium caliber ammunition | Michael C. Sachs | ARDEC |
| 9 | 8,607,683 | Active ammunition magazine | Henry S. Goldfine | ARDEC |
| 10 | 8,599,901 | Method and apparatus for tracking a frequency-hopped signal | Lawrence E. Anderson | ARL |
| 11 | 8,597,579 | Molecularly imprinted polymer-denuder based sensors | Ulysses John Biffoni | ECBC |
| 12 | 8,597,444 | Foamed celluloid combustible material | Henry S. Goldfine | ARDEC |
| 13 | 8,597,377 | Chlorine modified high voltage LiMn2O4 cathode material for rechargeable lithium/lithium-ion electrochemical systems | Azza Jayaprakash | CECOM |
| 14 | 8,597,273 | Burn patient resuscitation system | Elizabeth Arwine | MRMC |
| 15 | 8,594,455 | System and method for image enhancement and improvement | Lawrence E. Anderson | ARL |
| 16 | 8,594,147 | Monolithic diode pumped solid-state laser for high shock environments | Michael C. Sachs | ARDEC |

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| 17 | 8,593,729 | Multi-field of view annular folded optics | Richard J. Kim | CECOM |
| 18 | 8,592,758 | Vapor sampling adapter for direct analysis in real time mass spectrometry | Ulysses John Biffoni | ECBC |
| 19 | 8,592,301 | Template wafer fabrication process for small pitch flip-chip interconnect hybridization | Richard J. Kim | CECOM |
| 20 | 8,590,453 | Extending boom for stabilizing projectiles launched from an apparatus | Eric Brett Compton | ARL |
| 21 | 8,590,404 | Apparatus and methods for detecting propellant degradation in solid propellant fuel | William Bradley Haymond | AAMC |
| 22 | 8,587,188 | Light-emitting element based on laser carbonized polymer substrate | Ulysses John Biffoni | ECBC |
| 23 | 8,585,675 | Decision-assist method of resuscitation of patients | Elizabeth Arwine | MRMC |
| 24 | 8,584,732 | Mold release method for a cold spray process | Robert Thompson | ARL |
| 25 | 8,584,480 | Adaptable water harvesting apparatus | Kristin Kohler | USALSA |
| 26 | 8,580,350 | Corrosion resistant neutron absorbing coatings | Law Firm | ARL |
| 27 | 8,579,170 | Air-breathing battery backpack frame | Azza Jayaprakash | CECOM |
| 28 | 8,577,184 | System and method for super-resolution imaging from a sequence of color filter array (CFA) low-resolution images | Lawrence E. Anderson | ARL |
| 29 | 8,576,542 | Structural electrochemical capacitor | Christos S. Kyriakou | ARL |
| 30 | 8,575,045 | Fiber modified with particulate through a coupling agent | Christos S. Kyriakou | ARL |
| | | | William V. Adams | |
| 31 | 8,574,603 | Hatching kit for toxicity test | Elizabeth Arwine | MRMC |
| 32 | 8,573,550 | Radar antenna safety brace | Azza Jayaprakash | CECOM |
| 33 | 8,573,123 | Flexible detonator integrated with directly written energetics | Henry S. Goldfine | ARDEC |

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|---|---|---|---|---|
| 34 | 8,573,107 | Burster tube loading apparatus and method | Michael C. Sachs | ARDEC |
| 35 | 8,573,056 | Guided projectile with motion restricting piezoelectric actuator | Michael C. Sachs | ARDEC |
| 36 | 8,572,884 | Surrogate lower receiver | Michael C. Sachs | ARDEC |
| 37 | 8,572,815 | Universal tie down assembly | Henry S. Goldfine | ARDEC |
| 38 | 8,569,670 | Pressure activated inertially locking base for projectiles | Henry S. Goldfine | ARDEC |
| 39 | 8,567,300 | Time-delayed gun bore evacuator | Michael C. Sachs | ARDEC |
| 40 | 8,567,107 | Gun chamber cleaning brush with container | Henry S. Goldfine | ARDEC |
| 41 | 8,566,071 | Calibration and synchronization of micro air vehicle autopilots | Alan I. Kalb | ARL |
| | | | Eric Brett Compton | |
| 42 | 8,564,014 | Ultraviolet light emitting AlGaN composition and ultraviolet light emitting device containing same | Christos S. Kyriakou | ARL |
| 43 | 8,563,929 | Simultaneous dual band dual FOV imaging system | Richard J. Kim | CECOM |
| 44 | 8,562,700 | Multi-functional compact fuel converter and a process for converting liquid fuel | Eric Brett Compton | ARL |
| | | | John H. Raubitschek | |
| 45 | 8,561,540 | Rotating thumb safety fuze for a hand grenade and related methods of operation and assembly | Michael C. Sachs | ARDEC |
| 46 | 8,558,707 | Thermal cutoff fuse for arbitrary temperatures | Azza Jayaprakash | CECOM |
| 47 | 8,551,268 | Electric primer | Henry S. Goldfine | ARDEC |
| 48 | 8,550,004 | Riveted cartridge venting | Henry S. Goldfine | ARDEC |
| 49 | 8,549,661 | Apparatus for performing magnetic resonance force microscopy on large area samples | Alan I. Kalb | ARL |
| 50 | 8,546,906 | System and method for packaging of high-voltage semiconductor devices | Lawrence E. Anderson | ARL |

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|---|---|---|---|---|
| 51 | 8,546,313 | Nanotubular titania for decontamination of chemical warfare agents and toxic industrial chemicals | Ulysses John Biffoni | ECBC |
| 52 | 8,541,926 | Nano/micro electro-mechanical relay | Alan I. Kalb | ARL |
| 53 | 8,534,607 | Multiple bundle sling load system | Roger C. Phillips | NSRDEC |
| 54 | 8,532,486 | Method and apparatus for detecting radio-frequency signals using a dispersive fiber optical loop | Alan I. Kalb | ARL |
| 55 | 8,532,427 | System and method for image enhancement | Lawrence E. Anderson | ARL |
| 56 | 8,532,315 | High powered high speed switch | Alan I. Kalb | ARL |
| 57 | 8,530,719 | Zirconium hydroxide for decontaminating toxic agents | Ulysses John Biffoni | ECBC |
| 58 | 8,525,090 | Pneumatically actuated control surface for airframe body | Michael C. Sachs | ARDEC |
| 59 | 8,524,482 | Method and system for sampling and separating submicron-sized particles based on density and or size to detect the presence of a particular agent | Ulysses John Biffoni | ECBC |
| 60 | 8,524,155 | Virus and particulate separation from solution | Ulysses John Biffoni | ECBC |
| 61 | 8,522,685 | Multiple size fragment warhead | Michael C. Sachs | ARDEC |
| 62 | 8,514,392 | Spectrophotopolarimeter sensor and artificial neural network analytics for distant chemical and biological threat detection | Ulysses John Biffoni | ECBC |
| 63 | 8,513,005 | DNA immunogenic composition comprising a full-length modified poxvirus L1R gene fused to a tPA leader sequence | Elizabeth Arwine | MRMC |
| 64 | 8,511,145 | Explosive event discrimination | Henry S. Goldfine | ARDEC |
| 65 | 8,510,245 | Bayesian clinical decision model for determining probability of transplant glomerulopathy | Elizabeth Arwine | MRMC |
| 66 | 8,510,129 | Medical information handling system and method | Elizabeth Arwine | MRMC |
| 67 | 8,506,829 | Semiconductor hollow-core waveguide using photonic crystal gratings | Alan I. Kalb | ARL |

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|---|---|---|---|---|
| 68 | 8,505,797 | Sound-suppressed, powder-actuated stud driver | Henry S. Goldfine | ARDEC |
| 69 | 8,505,577 | Pnumatically actuated bi-propellant valve (PABV) system for a throttling vortex engine | Michael K. Gray | AAMC |
| 70 | 8,505,481 | Apparatus for growth of dilute-nitride materials using an isotope for enhancing the sensitivity of resonant nuclear reaction analysis | John H. Raubitschek | ARL |
| 71 | 8,503,885 | Quantum based information transmission system and method | Lawrence E. Anderson | ARL |
| 72 | 8,503,837 | Compact fiber optic positioner with wide frequency bandwidth | Alan I. Kalb | ARL |
| 73 | 8,502,731 | System and method for moving target detection | Lawrence E. Anderson | ARL |
| 74 | 8,501,926 | Malaria vaccine | Law Firm | MRMC |
| 75 | 8,499,694 | Two-fin stackable flechette having two-piece construction | Michael K. Gray | AAMC |
| 76 | 8,495,767 | Protective clothing ensemble with two-stage evaporative cooling | Elizabeth Arwine | MRMC |
| 77 | 8,494,024 | Beam quality of the monoblock laser through use of a 1.5 micron external cavity partial reflector | Richard J. Kim | CECOM |
| 78 | 8,493,573 | High-resolution optical position sensing with sparse, low-resolution detectors | Richard J. Kim | CECOM |
| 79 | 8,492,541 | Synthesis of azido heterocycles | Henry S. Goldfine | ARDEC |
| 80 | 8,492,428 | Small-molecule botulinum toxin inhibitors | Law Firm | MRMC |
| 81 | 8,490,054 | Software and related software tracking during software modification | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 82 | 8,488,638 | Method of forming a single common laser resonator cavity and an optically segmented composite gain medium | Richard J. Kim | CECOM |
| 83 | 8,488,635 | UV illumination for mitigation of cold temperature pyroelectric effects in lithium niobate | Richard J. Kim | CECOM |

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|---|---|---|---|---|
| 84 | 8,485,084 | Multi-axial explosive, laterally-shearing, reactive mechanism | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 85 | 8,479,727 | Enhanced chemical/biological respiratory protection system | Ulysses John Biffoni | ECBC |
| 86 | 8,479,314 | Ballistic and blunt impact protective knee and elbow pads | Roger C. Phillips | NSRDEC |
| 87 | 8,475,919 | Wool and aramid fiber blends for multifunctional protective clothing | Roger C. Phillips | NSRDEC |
| 88 | 8,472,887 | Radio frequency integrated circuit for enhanced transmit/receive performance in low power applications and method of making the same | Lawrence E. Anderson | ARL |
| 89 | 8,472,564 | Method of automated demodulation and classification of phase-shift-keying signals using hysteretic differential zero-crossing time samples | Stephen J. Harbulak | CECOM |
| 90 | 8,470,560 | CR-2 binding peptide P28 as molecular adjuvant for DNA vaccines | Elizabeth Arwine | MRMC |
| 91 | 8,466,317 | Preparation of insensitive bis(2,2,-dinitropropyl) nitramine (BDNPN) | Henry S. Goldfine | ARDEC |
| 92 | 8,465,712 | Desulfurization apparatus and method | Lawrence E. Anderson | ARL |
| 93 | 8,465,606 | Composition of matter for an incendiary device and method of manufacture | Ulysses John Biffoni | ECBC |
| 94 | 8,464,493 | Transportable modular configuration for holding panels | Brian C. Jones | USACE |
| 95 | 8,461,948 | Electronic ohmic shunt RF MEMS switch and method of manufacture | Avrom David Spevack | ARL |
| | | | Eric Brett Compton | |
| 96 | 8,459,911 | Cargo locking mechanisms and structures | Michael C. Sachs | ARDEC |
| 97 | 8,459,167 | Vented armor V structure | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |

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|---|---|---|---|---|
| | | | Thomas W. Saur | TACOM |
| 98 | 8,458,946 | Bipod adapter for firearm | Michael C. Sachs | ARDEC |
| 99 | 8,456,004 | Template wafer and process for small pitch flip-chip interconnect hybridization | Richard J. Kim | CECOM |
| 100 | 8,455,455 | Compositions and methods for silencing genes involved in hemorrhagic fever | Law Firm | MRMC |
| 101 | 8,454,892 | Chemical agent detection system for fluid media | Ulysses John Biffoni | ECBC |
| 102 | 8,454,224 | Fomite tumbler and method of transferring biological material | Ulysses John Biffoni | ECBC |
| 103 | 8,453,573 | Primer adapter for hand grenade fuze | Michael C. Sachs | ARDEC |
| 104 | 8,453,553 | Radially orthogonal, tubular energetically rotated armor (ROTERA) | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 105 | 8,448,760 | Progressively dampened hydraulic buffer system | Michael C. Sachs | ARDEC |
| 106 | 8,448,574 | Ultra-miniature electro-mechanical safety and arming device | Henry S. Goldfine | ARDEC |
| 107 | 8,448,560 | Propelled impacter reactive armor | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 108 | 8,446,925 | Reduction of timing jitter in a passive Q-switched solid state laser | Richard J. Kim | CECOM |
| 109 | 8,435,797 | Electroluminescent diode sensor | Richard J. Kim | CECOM |
| 110 | 8,435,364 | Hypergolic liquid or gel fuel mixtures | William Bradley Haymond | AAMC |
| 111 | 8,434,394 | Apparatus for adapting a rocket-assisted projectile for launch from a smooth bore tube | Henry S. Goldfine | ARDEC |
| 112 | 8,433,460 | Onboard sensor suite for determining projectile velocity | Michael C. Sachs | ARDEC |

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|---|---|---|---|---|
| 113 | 8,433,117 | Computer controlled system for laser energy delivery to the retina | Elizabeth Arwine | MRMC |
| 114 | 8,431,176 | Liquid chromatographic fraction of enzymatically polymerized flavonoid as an antioxidant | Roger C. Phillips | NSRDEC |
| 115 | 8,429,153 | Method and apparatus for classifying known specimens and media using spectral properties and identifying unknown specimens and media | Law Firm | SMDC |
| 116 | 8,427,814 | Mobile power distribution system | Ulysses John Biffoni | ECBC |
| 117 | 8,425,704 | Silicon-based explosive devices and methods of manufacture | Alan I. Kalb | ARL |
| 118 | 8,424,443 | Vented armor V structure | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 119 | 8,424,440 | Low blast overpressure muzzle brake | Michael C. Sachs | ARDEC |
| 120 | 8,418,622 | Shaped charge jet disruptor | Henry S. Goldfine | ARDEC |
| 121 | 8,418,392 | Compressed elastomer process for autofrettage and lining tubes | Christos S. Kyriakou | ARL |
| 122 | 8,418,389 | Recoil reduction apparatus and method for weapon | Michael C. Sachs | ARDEC |
| 123 | 8,415,598 | Extendable fins for a tube-launched projectile | Michael C. Sachs | ARDEC |
| 124 | 8,413,564 | Portable vented suppressive shield for protective tactical emplacement over suspected explosive devices | Ulysses John Biffoni | ECBC |
| 125 | 8,412,464 | Methods for detection and identification of cell type | Ulysses John Biffoni | ECBC |
| 126 | 8,409,130 | System for providing servo-controlled resuscitation | Elizabeth Arwine | MRMC |
| 127 | 8,405,494 | Apparatus for identifying threats using multiple sensors in a graphical user interface | Richard J. Kim | CECOM |
| 128 | 8,404,490 | Detecting nerve agents and determining the types thereof | Ulysses John Biffoni | ECBC |
| 129 | 8,402,877 | Protective ballistic shield | Michael C. Sachs | ARDEC |

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|---|---|---|---|---|
| 130 | 8,401,117 | Method of adaptive modulation for cognitive radios using a fast and simplified modulation recognition | Azza Jayaprakash | CECOM |
| 131 | 8,397,608 | Glow plug removal tool | Azza Jayaprakash | CECOM |
| 132 | 8,385,382 | Compact multi-wavelength and multi-beam laser | Richard J. Kim | CECOM |
| 133 | 8,383,290 | Fuel cell assembly | Avrom David Spevack | ARL |
| | | | Robert Thompson | |
| 134 | 8,381,657 | Enhanced grenade | Michael C. Sachs | ARDEC |
| 135 | 8,381,656 | Mechanical cartridge and grenade venting | Michael C. Sachs | ARDEC |
| 136 | 8,381,651 | Rotational variable pyrotechnic delay selector for munitions | Michael C. Sachs | ARDEC |
| 137 | 8,375,860 | Stackable, easily packaged and aerodynamically stable flechette | Michael K. Gray | AAMC |
| 138 | 8,373,107 | Method and apparatus for non-line-of-sight imaging of a first area using photons detected from a second area | Lawrence E. Anderson | ARL |
| 139 | 8,372,926 | Fatty acid monomers to reduce emissions and toughen polymers | Law Firm | ARL |
| 140 | 8,372,197 | Substrate temperature accuracy and temperature control flexibility in a molecular beam epitaxy system | John H. Raubitschek | ARL |
| 141 | 8,371,705 | Mirrors and methods of making same | Lawrence E. Anderson | ARL |
| | | | Eric Brett Compton | |
| 142 | 8,371,206 | Wedge-type breechblock bidirectional make-break assembly | Henry S. Goldfine | ARDEC |
| 143 | 8,371,059 | Aiming post light | Michael C. Sachs | ARDEC |
| 144 | 8,369,460 | Reduced complexity constellation pattern recognition and classification method | Stephen J. Harbulak | CECOM |
| 145 | 8,367,327 | Method for simultaneously detecting multiple biological threat agents | Ulysses John Biffoni | ECBC |
| 146 | 8,366,961 | Chemical combination for the generation of disinfectant and heat | Roger C. Phillips | NSRDEC |

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|---|---|---|---|---|
| 147 | 8,365,804 | Portable inflatable protective partitioning system | Ulysses John Biffoni | ECBC |
| 148 | 8,365,666 | Modular breaching and demolition system | Michael C. Sachs | ARDEC |
| 149 | 8,365,619 | Assembly and method for evaluating effectiveness of anti-fog coatings of eyewear lenses | Roger C. Phillips | NSRDEC |
| 150 | 8,365,373 | Agile tunable piezoelectric solidly-mounted resonator | Stephen J. Harbulak | CECOM |
| 151 | 8,363,310 | High power and high gain fiber amplifier | Richard J. Kim | CECOM |
| 152 | 8,363,300 | Large aperture polymer electro-optic shutter device and method of manufacturing same | John H. Raubitschek | ARL |
| 153 | 8,357,335 | Colorimetric assay for the determination of hydrolysis activity from HD and other halogenated organics | Ulysses John Biffoni | ECBC |
| 154 | 8,357,000 | Fluid-isolating, self-aligning make-break electrical connection | Michael C. Sachs | ARDEC |
| 155 | 8,356,437 | Firing pin position indicator for gun | Michael C. Sachs | ARDEC |
| 156 | 8,354,390 | Compositions and methods for inhibiting expression of a gene from the ebola virus | Law Firm | Unknown |
| 157 | 8,353,480 | Concentric peripheral canopy parachute | Roger C. Phillips | NSRDEC |
| 158 | 8,347,685 | Method and device for validating or calibrating a chemical detector at a point of use | Ulysses John Biffoni | ECBC |
| 159 | 8,342,852 | Trauma training system | Elizabeth Arwine | MRMC |
| 160 | 8,342,337 | Water sampling device and method for use with a radiation probe | Ulysses John Biffoni | ECBC |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/netahtml/PTO/index.html ) and PAIR (http:// portal.uspto.gov/pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

APPENDIX B

Calendar Year 2014 Patents Issued to the U.S. Army

| | **Patent Number** | **Title** | **Attorney** | **Research Org.** |
|---|---|---|---|---|
| 1 | 8,922,587 | Crew shared video display system and method | Eric B. Compton | ARL |
| 2 | 8,920,714 | Corrosion inhibiting self-expanding foam | John H. Raubitschek | CECOM |
| | | | Robert Thompson | |
| 3 | 8,919,257 | 155 mm XM1126 testing/training projectile | Michael C. Sachs | ARDEC |
| | | | Henry S. Goldfine | |
| 4 | 8,917,802 | Modulation scheme determination through use of multiple sensors | Azza Jayaprakash | CECOM |
| 5 | 8,912,577 | Distributed heating transistor devices providing reduced self-heating | Eric B. Compton | ARL |
| 6 | 8,912,316 | Compositions and methods for inhibiting expression of CD45 gene | Law Firm | MRMC |
| 7 | 8,911,742 | Transcutaneous immunization without heterologous adjuvant | Elizabeth Arwine | MRMC |
| 8 | 8,911,575 | Moldable explosives formulated with chlorinated waxes and oils | Henry S. Goldfine | ARDEC |
| 9 | 8,910,515 | Instrumented magnetic projectile | Michael C. Sachs | ARDEC |
| 10 | 8,907,686 | Method and apparatus for accelerating device degradation and diagnosing the physical changes of the device during the degradation process | Alan I. Kalb | ARL |
| 11 | 8,907,438 | Semiconducting organic photovoltaic sensor | Richard J. Kim | CECOM |
| 12 | 8,906,244 | Method for forming a device having nanopillar and cap structures | Alan I. Kalb | ARL |
| 13 | 8,900,756 | Solid state preparation method for lithium manganese oxide AB.sub.2O.sub.4 battery cathode | Azza Jayaprakash | CECOM |
| 14 | 8,900,752 | Lead manganese-based cathode material for lithium electrochemical | Azza Jayaprakash | CECOM |

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|---|---|---|---|---|
| | | systems | | |
| 15 | 8,893,604 | Modular munitions deployment platform | David L. Kuhn | TACOM |
| | | | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| 16 | 8,891,444 | Distributed geospatial communications system | Henry S. Goldfine | ARDEC |
| 17 | 8,887,641 | 40 mm low drag extended range projectile | Michael C. Sachs | ARDEC |
| 18 | 8,887,640 | Electro-mechanical fuze for hand grenades | Michael C. Sachs | ARDEC |
| 19 | 8,887,613 | Pin retainer on a missile launch rail | William Bradley Haymond | AAMC |
| 20 | 8,883,676 | Removal of toxic chemicals using metal-organic frameworks (MOFs) post-treated via plasma-enhanced chemical vapor deposition (PECVD) with fluorocarbons | Ulysses John Biffoni | ECBC |
| 21 | 8,882,085 | Micro atomizer | Ulysses John Biffoni | ECBC |
| 22 | 8,877,677 | Filtration media and process for the removal of hazardous materials from air streams | Ulysses John Biffoni | ECBC |
| 23 | 8,876,295 | Method for displaying images and/or other information on aircraft blades | Lawrence E. Anderson | ARL |
| 24 | 8,875,589 | Sampling and counting system | Ulysses John Biffoni | ECBC |
| 25 | 8,874,377 | Photon counting based particles detection method and apparatus | Ulysses John Biffoni | ECBC |
| 26 | 8,872,595 | Binary bi-phase shift modulator | Alan I. Kalb | ARL |
| | | | Eric B. Compton | |
| 27 | 8,868,238 | Apparatus and method for systematic control of robotic deployment and extraction | David L. Kuhn | TACOM |
| | | | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |

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| 28 | 8,866,367 | Thermally oxidized seed layers for the production of {001} textured electrodes and PZT devices and method of making | Eric B. Compton | ARL |
| 29 | 8,861,588 | Apparatus and method for sampling and reconstruction of wide bandwidth signals below Nyquist rate | Lawrence E. Anderson | ARL |
| 30 | 8,861,567 | Method and apparatus for analyzing the spectrum of radio-frequency signals using a fiber optic recirculation loop | Alan I. Kalb | ARL |
| 31 | 8,860,159 | Spintronic electronic device and circuits | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| | | | David L. Kuhn | TACOM |
| 32 | 8,859,105 | Configuration for improving bonding and corrosion resistance of reinforcement material | Brian G. Jones | USACE |
| 33 | 8,857,341 | Flying primer for hand grenade fuze | Henry S. Goldfine | ARDEC |
| 34 | 8,857,308 | Cannon breechblock insert assembly | Michael C. Sachs | ARDEC |
| 35 | 8,854,618 | Hand-held raman laser device for distant life-death determination by molecular peri-mortem plume fuzzy membership function | Richard J. Kim | CECOM |
| 36 | 8,854,257 | Conformal array, luneburg lens antenna system | Michael K. Gray | AAMC |
| 37 | 8,854,003 | Technique for rapid battery capacity testing | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| | | | David L. Kuhn | TACOM |
| 38 | 8,852,598 | Puumala virus full-length M segment-based DNA vaccines | Elizabeth Arwine | MRMC |
| 39 | 8,850,885 | Water air-bubble fragment recovery test apparatus | Michael C. Sachs | ARDEC |
| 40 | 8,848,904 | Method and implementation for information exchange using Markov models | Law Firm | ARL |

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|---|---|---|---|---|
| 41 | 8,848,046 | Kinetic energy absorber and method for gun-launched projectile | Michael C. Sachs | ARDEC |
| 42 | 8,844,444 | Reusable test projectile | Henry S. Goldfine | ARDEC |
| | | | Michael C. Sachs | |
| 43 | 8,842,281 | System and method for detecting the amount of stabilizer degradation in solid rocket propellant | William Bradley Haymond | AAMC |
| 44 | 8,836,794 | Dual field of view multi-band optics | Richard J. Kim | CECOM |
| 45 | 8,834,958 | Process of making negative electrode | John H. Raubitschek | CECOM |
| | | | Robert Thompson | |
| 46 | 8,834,831 | Controlling morpholoy of titanium oxide using designed peptides | Roger C. Phillips | NSRDEC |
| 47 | 8,834,311 | Concentric electric servomotor/gearbox drive | Michael C. Sachs | ARDEC |
| 48 | 8,833,223 | Multi-petal projectile adapter for a dearmer | Michael C. Sachs | ARDEC |
| 49 | 8,830,571 | Multi-field of view annular folded optics | Richard J. Kim | CECOM |
| 50 | 8,830,476 | Methods and apparatuses for contact-free holographic imaging of aerosol particles | Eric B. Compton | ARL |
| 51 | 8,829,439 | Target detector with size detection and method thereof | Lawrence E. Anderson | ARL |
| 52 | 8,829,373 | Three-axis acceleration switch array | Alan I. Kalb | ARL |
| 53 | 8,826,796 | Tapered V underbody protection enhancement | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| | | | David L. Kuhn | TACOM |
| 54 | 8,826,795 | Blast hop mitigation device | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| | | | David L. Kuhn | TACOM |

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|---|---|---|---|---|
| 55 | 8,824,544 | Method and system for recovery of missing spectral information in wideband signal | Lawrence E. Anderson | ARL |
| 56 | 8,824,200 | Nonvolative memory cells programable by phase change | Lawrence E. Anderson | ARL |
| 57 | 8,818,746 | Crack detection in thick-walled cylinders | Henry S. Goldfine | ARDEC |
| 58 | 8,816,397 | Ring-shaped transistors providing reduced self-heating | Eric B. Compton | ARL |
| 59 | 8,815,996 | Surface segregating additives for enhanced chemical agent resistant topcoats | Eric B. Compton | ARL |
| | | | Christos S. Kyriakou | |
| 60 | 8,813,651 | Method of making shaped charges and explosively formed projectiles | Michael C. Sachs | ARDEC |
| 61 | 8,813,629 | Positional lock for carrier assembly of breech-loaded weapon | Michael C. Sachs | ARDEC |
| 62 | 8,813,582 | Dilution and sampling system | Ulysses John Biffoni | ECBC |
| 63 | 8,811,768 | Image enhancement system and method | Lawrence E. Anderson | ARL |
| 64 | 8,811,763 | Method and system for producing image frames using quantum properties | Lawrence E. Anderson | ARL |
| 65 | 8,810,996 | Inkjet-printed flexible electronic components from graphene oxide | Law Firm | ARDEC |
| 66 | 8,809,435 | Process enhancement via stimuli responsive particle surfaces | Robert Thompson | ARL |
| 67 | 8,809,042 | Plug flow reactor process for anaerobic cellulosic ethanol | Ulysses John Biffoni | ECBC |
| 68 | 8,800,421 | Positive locking mechanism for rotating helicopter mount | Michael C. Sachs | ARDEC |
| 69 | 8,796,082 | Method of optimizing a GA--nitride device material structure for a frequency multiplication device | Lawrence E. Anderson | ARL |
| 70 | 8,795,904 | Nonaqueous electrolyte solvents and additives | John H. Raubitschek | CECOM |
| 71 | 8,795,677 | Treatment methods using an F1-V plague vaccine | Elizabeth Arwine | MRMC |
| 72 | 8,794,156 | Safety projectile for firearms | Michael K. Gray | AAMC |
| 73 | 8,791,759 | Bipolar stacked transistor architecture | Law Firm | ARL |

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| 74 | 8,789,469 | Grenade pull pin assembly | Michael C. Sachs | ARDEC |
| 75 | 8,785,547 | Toughening cross-linked thermosets | Law Firm | Unknown |
| 76 | 8,783,154 | Seebeck active cooling device for caliber weapons | Henry S. Goldfine | ARDEC |
| 77 | 8,781,672 | System and method for importance sampling based time-dependent reliability prediction | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| | | | David L. Kuhn | TACOM |
| 78 | 8,779,977 | Electro optical scanning phased array antenna for pulsed operation | Alan I. Kalb | ARL |
| 79 | 8,778,889 | Antimicrobial decapeptide oral hygiene treatment | Elizabeth Arwine | MRMC |
| 80 | 8,778,671 | Construction of West Nile virus and dengue virus chimeras for use in a live virus vaccine to prevent disease caused by West Nile virus | Law Firm | MRMC |
| 81 | 8,776,692 | Flameless smoke pot | Ulysses John Biffoni | ECBC |
| 82 | 8,775,428 | Method and apparatus for predicting object properties and events using similarity-based information retrieval and modeling | Law Firm | SMDC |
| 83 | 8,771,831 | Multi-functional yarns and fabrics having anti-microbial, anti-static and anti-odor characterisitics | Roger C. Phillips | NSRDEC |
| 84 | 8,768,874 | Predicting the outcome of a chaotic system using Lyapunov exponents | Christos S. Kyriakou | ARL |
| 85 | 8,764,202 | Retro-reflective article | Roger C. Phillips | NSRDEC |
| 86 | 8,755,514 | Dual-tone multi-frequency signal classification | Azza Jayaprakash | CECOM |
| 87 | 8,755,469 | Method of spectrum mapping and exploitation using distributed sensors | Azza Jayaprakash | CECOM |
| 88 | 8,752,472 | Recoil reduction apparatus and method for weapon | Michael C. Sachs | ARDEC |
| 89 | 8,752,432 | Self diagnostic composite armor | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |

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|---|---|---|---|---|
| | | | Thomas W. Saur | TACOM |
| 90 | 8,750,425 | Asymptotically optimal modulation classification method for software defined radios | Azza Jayaprakash | CECOM |
| 91 | 8,748,331 | Biogenic template for enhanced sorption of contaminants | Brian C. Jones | USACE |
| 92 | 8,747,041 | Stress distributing threaded fastener assembly | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 93 | 8,746,741 | Truncated V underbody protection enhancement | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 94 | 8,746,124 | Multi-axial explosive, laterally-shearing, tiled reactive mechanism--MAELSTRM | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 95 | 8,742,628 | Solid state circuit breaker | Eric Brett Compton | ARL |
| 96 | 8,742,111 | Synthesis of intermediate anilino methyl esters used in the production of synthetic opioid analgesics | Ulysses John Biffoni | ECBC |
| 97 | 8,738,330 | Scalable, inert munition data recorder and method to characterize performance of a weapon system | Michael C. Sachs | ARDEC |
| 98 | 8,736,503 | Compact Rotman lens using metamaterials | Alan I. Kalb | ARL |
| 99 | 8,735,789 | Extendable stabilizer for projectile | Michael C. Sachs | ARDEC |
| 100 | 8,735,369 | Compositions and methods for inhibiting expression of a gene from the Ebola virus | Law Firm | Unknown |
| 101 | 8,730,456 | Compact monostatic optical receiver and transmitter | Richard J. Kim | CECOM |

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| 102 | 8,728,409 | Apparatus and method for suspension wicking of nanoparticles into microchannels | Lawrence E. Anderson | ARL |
| 103 | 8,724,216 | Dual band infrared continuous zoom lens | Richard J. Kim | CECOM |
| 104 | 8,722,418 | Thermal indicating composition | Henry S. Goldfine | ARDEC |
| 105 | 8,722,046 | Human monoclonal antibodies protective against bubonic plague | Elizabeth Arwine | MRMC |
| 106 | 8,720,342 | Low collateral damage fragmentation warhead | Michael C. Sachs | ARDEC |
| 107 | 8,715,751 | Artemisinins in the clinical and veterinary management of kinetoplastid infections | Elizabeth Arwine | MRMC |
| 108 | 8,710,185 | Bacterial superantigen vaccines | Elizabeth Arwine | MRMC |
| 109 | 8,709,487 | Nanoparticle entrapment of materials | Roger C. Phillips | NSRDEC |
| 110 | 8,709,378 | Catalyst and process of hydrocarbon feedstock reformation to hydrogen and carbon monoxide | Eric B. Compton | ARL |
| | | | Christos S. Kyriakou | |
| | | | Richard A. Morgan | |
| 111 | 8,708,884 | Systems and methods for adaptive mitigation of motion sickness | Eric B. Compton | ARL |
| 112 | 8,707,849 | Modular mortar baseplate | Michael C. Sachs | ARDEC |
| 113 | 8,707,764 | Assembly and method for standardized insensitive munitions testing | Michael C. Sachs | ARDEC |
| 114 | 8,704,209 | Photodetectors using resonance and method of making | Lawrence E. Anderson | ARL |
| 115 | 8,703,762 | Method of treating organophosphorous poisoning | Law Firm | MRMC |
| 116 | 8,701,877 | Container for storing devices with energetic material | Michael C. Sachs | ARDEC |
| 117 | 8,697,856 | Plasmodium vivax hybrid circumsporozoite protein and vaccine | Elizabeth Arwine | MRMC |
| 118 | 8,696,838 | Foamed celluloid process using expandable beads | Henry S. Goldfine | ARDEC |

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| 119 | 8,695,507 | Composite sabot | Henry S. Goldfine | ARDEC |
| 120 | 8,694,085 | Collection and analysis of vital signs | Elizabeth Arwine | MRMC |
| 121 | 8,693,183 | Adapter for ruggedized personal data assistant | Henry S. Goldfine | ARDEC |
| 122 | 8,692,691 | Infrared laser landing marker | Richard J. Kim | CECOM |
| 123 | 8,691,859 | Broad spectrum antibacterial compounds | Elizabeth Arwine | MRMC |
| 124 | 8,689,668 | Automatic crimping tool | Michael C. Sachs | ARDEC |
| 125 | 8,686,576 | System and method for harvesting electrical energy by linear induction | Michael C. Sachs | ARDEC |
| 126 | 8,685,108 | Modular prosthetic foot | Elizabeth Arwine | MRMC |
| 127 | 8,682,692 | Medical information handling method | Elizabeth Arwine | MRMC |
| 128 | 8,678,655 | Reinforced slewing bearing | Henry S. Goldfine | ARDEC |
| 129 | 8,673,614 | Anaerobic microbial composition and methods of using same | Elizabeth Arwine | MRMC |
| 130 | 8,673,103 | Method of fabricating an armor panel | Luis Miguel Acosta | TACOM |
| | | | David L. Kuhn | TACOM |
| | | | Thomas W. Saur | TACOM |
| 131 | 8,672,270 | Tie down and jack fitting assembly for helicopter | Michael K. Gray | AAMC |
| 132 | 8,667,841 | Glovebox air intake emergency safety shutoff | Ulysses John Biffoni | ECBC |
| 133 | 8,666,196 | System and method for super-resolution imaging from a sequence of color filter array (CFA) low-resolution images | Lawrence E. Anderson | ARL |
| 134 | 8,665,132 | System and method for iterative fourier side lobe reduction | Lawrence E. Anderson | ARL |
| 135 | 8,663,450 | Guide bore electrical machining methods | Henry S. Goldfine | ARDEC |
| 136 | 8,663,406 | Melt cast insensitive eutectic explosive | Christos S. Kyriakou | ARL |
| | | | Richard A. Morgan | |

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| 137 | 8,663,156 | System and method for providing servo-controlled resuscitation | Elizabeth Arwine | MRMC |
| 138 | 8,663,108 | Method and system for rapidly and passively identifying changes in number of open pores in the skin of an individual | Richard J. Kim | CECOM |
| 139 | 8,661,984 | Sabot | Christos S. Kyriakou | ARL |
| 140 | 8,661,962 | Bipod-mounted mortar fire control system | Michael C. Sachs | ARDEC |
| 141 | 8,659,753 | Apparatus and method for measuring energy in a laser beam | Ulysses John Biffoni | ECBC |
| 142 | 8,658,555 | Compositions comprising zirconium hydroxide and graphite oxide and methods for use | Ulysses John Biffoni | ECBC |
| 143 | 8,658,088 | Hand-held device with reagents and method for detection and diagnostics | Ulysses John Biffoni | ECBC |
| 144 | 8,657,484 | Apparatus for mixing contents enclosed within a container | Ulysses John Biffoni | ECBC |
| 145 | 8,652,458 | Tissue graft with non-aligned fiber matrix retains mesenchymal progenitor cells on the non-injury-facing side | Law Firm | MRMC |
| 146 | 8,651,964 | Advanced video controller system | Michael K. Gray | AAMC |
| 147 | 8,647,633 | Recombinant F1-V plague vaccine | Elizabeth Arwine | MRMC |
| 148 | 8,642,746 | Unique calibrator polynucleotides and methods of using in quantitative nucleic acid assays | Elizabeth Arwine | MRMC |
| 149 | 8,640,625 | Kinetic energy training projectile | Michael C. Sachs | ARDEC |
| 150 | 8,640,624 | Low collateral damage air defense projectile | Michael C. Sachs | ARDEC |
| 151 | 8,640,620 | Non-inertial safe and arm device | Michael C. Sachs | ARDEC |
| 152 | 8,640,591 | Transparent armor with improved multi-hit performance by use of a thin cover glass | Law Firm | ARL |
| 153 | 8,637,901 | Low-defect density gallium nitride semiconductor structures and devices thereof | Robert Thompson | ARL |

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| 154 | 8,636,861 | High explosive fills for MEMS devices | Henry S. Goldfine | ARDEC |
| 155 | 8,635,551 | Graphic user interface and software for processing large size signal data samples in a small buffer using automatically adjusted decimation ratio | Azza Jayaprakash | CECOM |
| 156 | 8,632,918 | Electrolyte formulations for wide temperature lithium ion batteries | Robert Thompson | ARL |
| | | | Avrom David Spevack | |
| | | | William V. Adams | |
| 157 | 8,629,480 | Hetero-junction tunneling transistor | Alan I. Kalb | ARL |
| 158 | 8,627,771 | Selectable fragment size fragmentation warhead | Michael C. Sachs | ARDEC |
| 159 | 8,624,773 | Multidirectional target detecting system and method | Lawrence E. Anderson | ARL |
| 160 | 8,623,156 | Pyrophoric materials and methods of making same | Henry S. Goldfine | ARDEC |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/ netahtml/PTO/index.html ) and PAIR (http:// portal.uspto.gov/pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

APPENDIX C

Calendar Year 2015 Patents Issued to the U.S. Army

| | **Patent Number** | **Title** | **Attorney** | **Research Org.** |
|---|---|---|---|---|
| 1 | 9,223,091 | Light beam collimator particularly suitable for a densely packed array | Alan I. Kalb | ARL |
| 2 | 9,223,021 | Method and system for motion compensated target detection using acoustical focusing | Lawrence E. Anderson | ARL |
| 3 | 9,222,874 | Systems and methods for individually trapping particles from air and measuring the optical spectra or other properties of individual trapped particles | Eric Brett Compton | ARL |
| 4 | 9,216,404 | Removal of toxic chemicals using metal-organic frameworks (MOFs) post-treated via plasma-enhanced chemical vapor deposition (PECVD) with fluorocarbons | Ulysses John Biffoni | ECBC |
| 5 | 9,212,877 | Retention system for a deployable projectile fin | Christos S. Kyriakou | ARL |
| 6 | 9,212,876 | Large caliber frangible projectile | Henry S. Goldfine | ARDEC |
| 7 | 9,212,102 | Spray drying of metallized explosive | John P. DiScala | ARDEC |
| 8 | 9,211,586 | Non-faceted nanoparticle reinforced metal matrix composite and method of manufacturing the same | Henry S. Goldfine | ARDEC |
| 9 | 9,204,547 | Non-planar printed circuit board with embedded electronic components | Michael K. Gray | AAMC |
| 10 | 9,194,675 | Training (reuseable), and tactical (guidance adaptable), 40 mm projectile | Michael C. Sachs | ARDEC |
| 11 | 9,194,664 | Main gun shield for battle tank | Michael C. Sachs | ARDEC |
| 12 | 9,193,739 | Induction of highly specific antibodies to a hapten but not to a carrier peptide by immunization | Elizabeth Arwine | MRMC |
| 13 | 9,193,638 | Condensed phase energetic time delay compositions | Henry S. Goldfine | ARDEC |

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| 14 | 9,193,637 | Magnesium/alkyl polysulfide white star illuminants | Henry S. Goldfine | ARDEC |
| 15 | 9,190,509 | High mobility, thin film transistors using semiconductor/insulator transition-metal dichalcogenide based interfaces | Eric Brett Compton | ARL |
| 16 | 9,190,217 | Method for forming a structural electrochemical capacitor | Christos S. Kyriakou | ARL |
| 17 | 9,187,516 | Compositions and methods for inhibiting expression of a gene from the Ebola virus | Law Firm | MRMC |
| 18 | 9,186,270 | Dynamic exoskeletal orthosis | Law Firm | MRMC |
| 19 | 9,186,064 | Internal optical spectroscope and method for real time in-situ diagnosis in living cells | William Bradley Haymond | AAMC |
| 20 | 9,181,432 | Branched additives for polymer toughening | Christos S. Kyriakou | ARL |
| 21 | 9,181,067 | Suspended payload stability device | Roger C. Phillips | NSRDEC |
| 22 | 9,180,973 | Method of improved load distribution over the surface of a parachute canopy | Roger C. Phillips | NSRDEC |
| 23 | 9,180,597 | Mobile analytical screening, verification, and containment system | Ulysses John Biffoni | ECBC |
| 24 | 9,179,202 | Multiple-frequency signal classification through use of a second-order statistic | Azza Jayaprakash | CECOM |
| 25 | 9,178,544 | Parameter offset estimation through use of a secondary signal collected from multiple sensors | Azza Jayaprakash | CECOM |
| 26 | 9,177,133 | Multi-function smart communication card | Azza Jayaprakash | CECOM |
| 27 | 9,175,933 | Simple low-cost hand-held landmine neutralization device | Richard J. Kim | CECOM |
| 28 | 9,175,914 | Remote weapons charging handle adapter | Henry S. Goldfine | ARDEC |
| 29 | 9,175,422 | Polymer-micelle complex as an aid to electrospinning | Roger C. Phillips | NSRDEC |
| 30 | 9,172,476 | Method and system for removal of noise in signal | Lawrence E. Anderson | ARL |

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| 31 | 9,166,068 | Semiconductor heterobarrier electron device and method of making | Lawrence E. Anderson | ARL |
| 32 | 9,165,721 | Inkjet-printed flexible electronic components from graphene oxide | Law Firm | ARDEC |
| 33 | 9,163,334 | Actuators based on unbalanced moments of inertia | Roger C. Phillips | NSRDEC |
| 34 | 9,161,214 | Wireless communication method and system for transmission authentication at the physical layer | Law Firm | ARL |
| 35 | 9,157,716 | Shot start ring for projectile | Michael C. Sachs | ARDEC |
| 36 | 9,157,708 | Electric and magnetic field hardened igniter for electrically fired ammunition | Henry S. Goldfine | ARDEC |
| 37 | 9,157,705 | Projector for defeating buried mines | Henry S. Goldfine | ARDEC |
| 38 | 9,156,945 | Mixed organic and inorganic polymers | Law Firm | NSRDEC |
| 39 | 9,156,041 | Dimethylmethylphosphonate vapor generator | Ulysses John Biffoni | ECBC |
| 40 | 9,155,924 | Modular chemical/biological headgear system | Ulysses John Biffoni | ECBC |
| 41 | 9,154,704 | Radial FPA based electro-optic imager | Richard J. Kim | CECOM |
| 42 | 9,152,880 | Method for modeling human visual discrimination task performance of dynamic scenes | Richard J. Kim | CECOM |
| 43 | 9,151,787 | Method and apparatus for the measurement of radio-frequency electric permittivity by a meander-line ring resonator | Eric Brett Compton | ARL |
| | | | John H. Raubitschek | ARL |
| 44 | 9,150,431 | Fluorophthalocyanine photodynamic water sterilization | Henry S. Goldfine | ARDEC |
| 45 | 9,147,924 | Waveguide to co-planar-waveguide (CPW) transition | Alan I. Kalb | ARL |
| 46 | 9,145,211 | Method of improved load distribution over the surface of a parachute canopy | Roger C. Phillips | NSRDEC |
| 47 | 9,140,522 | Compositionally graded transparent ceramic armor | Henry S. Goldfine | ARDEC |
| 48 | 9,140,507 | Obturator seal apparatus and method | Henry S. Goldfine | ARDEC |

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| 49 | 9,140,504 | Performance testing apparatus for microclimate cooling unit | Henry S. Goldfine | ARDEC |
| 50 | 9,140,339 | Rotational assist drive mechanism | Henry S. Goldfine | ARDEC |
| 51 | 9,137,935 | Electromagnetic field assisted self-assembly with formation of electrical contacts | Guy M. Miller | ARL |
| 52 | 9,133,253 | Ricin vaccine and methods of making thereof | Elizabeth Arwine | MRMC |
| 53 | 9,133,072 | Tactical capsule charge system | Henry S. Goldfine | ARDEC |
| 54 | 9,132,135 | Method of treating organophosphorous poisoning | Law Firm | MRMC |
| 55 | 9,131,128 | System and processor implemented method for improved image quality and generating an image of a target illuminated by quantum particles | Eric Brett Compton | ARL |
| 56 | 9,128,157 | Surface scanning radio frequency antenna for magnetic resonance force microscopy | Alan I. Kalb | ARL |
| 57 | 9,127,370 | Power-free apparatus for hydrogen generation from alcohol | Robert Thompson | ARL |
| | | | Freda L. Krosnick | ARL |
| 58 | 9,123,114 | System and processor implemented method for improved image quality and enhancement based on quantum properties | Lawrence E. Anderson | ARL |
| 59 | 9,122,610 | OS friendly microprocessor architecture | Michael K. Gray | AAMC |
| 60 | 9,121,679 | Limited range projectile | Henry S. Goldfine | ARDEC |
| 61 | 9,120,868 | Recombinantly expressed Plasmodium CelTOS antigen and methods of use thereof | Elizabeth Arwine | MRMC |
| 62 | 9,119,828 | Antibodies with simultaneous subsite specificities to protein and lipid epitopes | Elizabeth Arwine | MRMC |
| 63 | 9,118,164 | Composite laser gain medium | Eric Brett Compton | ARL |
| 64 | 9,117,937 | Group III nitride semiconductor frequency multiplier | Lawrence E. Anderson | ARL |
| 65 | 9,116,838 | Determining lyapunov exponents of a chaotic system | Christos S. Kyriakou | ARL |

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| 66 | 9,116,835 | Method and apparatus for estimating cerebral cortical source activations from electroencephalograms | Eric Brett Compton | ARL |
| 67 | 9,116,348 | Laser mapping tool and weapon replacement fixture | Henry S. Goldfine | ARDEC |
| 68 | 9,115,968 | Course self-correcting projectile | Michael C. Sachs | ARDEC |
| 69 | 9,115,240 | Color changing polymer films for detecting chemical and biological targets | Law Firm | ECBC |
| 70 | 9,115,205 | Plasmodium falciparum circumsporozoite vaccine gene optimization for soluble protein expression | Law Firm | MRMC |
| 71 | 9,114,779 | High voltage lithium ion positive electrode material with improved cycle life | Eric Brett Compton | ARL |
| 72 | 9,108,601 | Trailer braking system for use with a fifth wheel/gooseneck hitch having a surge brake actuator | Eric Brett Compton | ARL |
| 73 | 9,107,595 | Node excitation driving function measures for cerebral cortex network analysis of electroencephalograms | Eric Brett Compton | ARL |
| 74 | 9,106,715 | System and method for rapid dissemination of image products | C. Joan Gilsdorf | SMDC |
| 75 | 9,102,807 | Toughening cross-linked thermosets | Law Firm | Unknown |
| 76 | 9,102,204 | Hitch-mounted mortar munition system | Henry S. Goldfine | ARDEC |
| 77 | 9,097,790 | Method and apparatus for providing radio frequency photonic filtering | Alan I. Kalb | ARL |
| | | | Eric Brett Compton | ARL |
| 78 | 9,097,713 | Monoclonal antibodies against glycoprotein of Ebola sudan boniface virus | Law Firm | Unknown |
| 79 | 9,097,624 | External filter assembly adapted for modifying a suction cleaning device to perform biological sampling | Ulysses John Biffoni | ECBC |
| 80 | 9,096,426 | Electronic device structure and method of making electronic devices and integrated circuits using grayscale technology and multilayer thin-film composites | Lawrence E. Anderson | ARL |

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|---|---|---|---|---|
| 81 | 9,091,840 | Dual spectral-band optical lens imager | Richard J. Kim | CECOM |
| 82 | 9,091,652 | Method of sensing nitroaromatic electron accepting compounds using a photovoltaic sensor | Richard J. Kim | CECOM |
| 83 | 9,086,351 | Fixture for system-level glove testing of contact permeation | Ulysses John Biffoni | ECBC |
| 84 | 9,083,449 | Method and system for optimizing signal recognition in a multiwavelength optical communication system | Lawrence E. Anderson | ARL |
| 85 | 9,083,208 | Ball bearing supported electromagnetic microgenerator | Alan I. Kalb | ARL |
| 86 | 9,081,029 | Apparatus for mechanically robust thermal isolation of components | Alan I. Kalb | ARL |
| 87 | 9,080,984 | Blast, ballistic and blunt trauma sensor | Robert Thompson | ARL |
| 88 | 9,075,129 | Method and system for forming images by comparing subsets of image data | Lawrence E. Anderson | ARL |
| 89 | 9,074,856 | Gun-launched anchor projectile for climbing | Henry S. Goldfine | ARDEC |
| 90 | 9,074,849 | Camouflage for garment assembly | Roger C. Phillips | NSRDEC |
| 91 | 9,074,195 | Nanoparticle entrapment of materials | Roger C. Phillips | NSRDEC |
| 92 | 9,074,034 | Multilayer hydrogels with pH-responsive swelling and surface wettability | Law Firm | USACE |
| 93 | 9,073,800 | Insensitive high energy crystaline explosives | Henry S. Goldfine | ARDEC |
| 94 | 9,064,315 | System and processor implemented method for improved image quality and enhancement | Lawrence E. Anderson | ARL |
| 95 | 9,063,046 | Hand-held device with reagents and method for detection and diagnostics | Ulysses John Biffoni | ECBC |
| 96 | 9,063,039 | Soft body armor durability tester | Roger C. Phillips | NSRDEC |

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| 97 | 9,062,938 | Camouflage patterns | Roger C. Phillips | NSRDEC |
| 98 | 9,061,085 | Hand-held device with reagents and method for detection and diagnostics | Ulysses John Biffoni | ECBC |
| 99 | 9,057,783 | Change detection method and system for use in detecting moving targets behind walls, barriers or otherwise visually obscured | Lawrence E. Anderson | ARL |
| 100 | 9,057,778 | Remote sensing using coherent sonic wave photoacoustic detection and methods | Lawrence E. Anderson | ARL |
| 101 | 9,055,145 | Recovery of DTMF tones in the presence of periodic interference and obstruction | Azza Jayaprakash | CECOM |
| 102 | 9,052,173 | Sabots for rifled guns | Christos S. Kyriakou | ARL |
| 103 | 9,051,177 | Active optical limiting semiconductor device and method with active region transparent to light becoming opaque when not biased | Lawrence E. Anderson | ARL |
| 104 | 9,047,881 | Nonvolatile corruption resistent magnetic memory and method thereof | Lawrence E. Anderson | ARL |
| 105 | 9,046,508 | Simulated explosive composition | Ulysses John Biffoni | ECBC |
| 106 | 9,046,334 | Non-lethal obscuration grenade | Ulysses John Biffoni | ECBC |
| 107 | 9,042,496 | Signal modulation scheme determination through an at least fourth-order noise-insensitive cumulant | Azza Jayaprakash | CECOM |
| 108 | 9,040,640 | Microbial growth enhancement from a dry film additive | Robert Thompson | ARL |
| 109 | 9,038,539 | Warhead case and method for making same | Robert Thompson | ARL |
| 110 | 9,036,942 | Link between handheld device and projectile | Azza Jayaprakash | CECOM |
| 111 | 9,036,688 | Rapid modulation scheme determination for linear digital signals | Azza Jayaprakash | CECOM |

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| 112 | 9,034,289 | Method and apparatus for prolonging the service life of a collective protection filter using a guard bed | Ulysses John Biffoni | ECBC |
| 113 | 9,032,878 | Obscurant generating, ground-based, networked munition | Henry S. Goldfine | ARDEC |
| 114 | 9,030,780 | Method and apparatus for reading a non-volatile memory using a spin torque oscillator | Lawrence E. Anderson | ARL |
| 115 | 9,030,503 | Anamorphic eyepiece with a microlens array for a panoramic field of view | Richard J. Kim | CECOM |
| 116 | 9,025,316 | Inkjet-printed flexible electronic components from graphene oxide | Law Firm | ARDEC |
| 117 | 9,024,238 | Ground surface reconnaissance projectile | Michael C. Sachs | ARDEC |
| 118 | 9,023,291 | Colorimetric detector | Ulysses John Biffoni | ECBC |
| 119 | 9,021,961 | Enhanced stability extended range (guidance adaptable) 40 mm projectile | Michael C. Sachs | ARDEC |
| 120 | 9,021,960 | Isolated coaxial high-pressure feed-through fitting | Henry S. Goldfine | ARDEC |
| 121 | 9,021,957 | Gun-launched non-lethal projectile with solid propellant rocket motor | Henry S. Goldfine | ARDEC |
| 122 | 9,021,954 | Reactive conductors for increased efficiency of exploding foil initiators and other detonators | Eric Brett Compton | ARL |
| | | | Alan I. Kalb | ARL |
| 123 | 9,021,865 | Apparatus and method for measuring permeation of contaminants through protective materials | Ulysses John Biffoni | ECBC |
| 124 | 9,019,366 | Laser pointer system for day and night use | Richard J. Kim | CECOM |
| 125 | 9,018,734 | Single wall carbon nanotube diodes | Christos S. Kyriakou | ARL |
| | | | Eric Brett Compton | ARL |
| 126 | 9,017,982 | Non-wild-type organophosphorus acid anhydrolases for enzymatic decontamination | Ulysses John Biffoni | ECBC |
| 127 | 9,016,671 | Coaxial needle atomizing system | Ulysses John Biffoni | ECBC |

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|---|---|---|---|---|
| 128 | 9,013,191 | Microwave cavity with dielectric region and method thereof | Lawrence E. Anderson | ARL |
| 129 | 9,011,067 | System and method for vehicle deployment, extraction, and stowage | Thomas W. Saur | TACOM |
| | | | Luis Miguel Acosta | TACOM |
| 130 | 9,010,250 | Fuze pull pin detent device | Michael C. Sachs | ARDEC |
| 131 | 9,010,248 | 40 mm gun sleeve cartridge case for M320 grenade launcher ammunition | Michael C. Sachs | ARDEC |
| 132 | 9,006,633 | Passive imaging correction system using feedback including a variable aperture with plural settings and method thereof | Lawrence E. Anderson | ARL |
| 133 | 9,004,454 | Container lift and leveling system | Ulysses John Biffoni | ECBC |
| 134 | 9,003,562 | Body armor | Thomas W. Saur | TACOM |
| | | | Luis Miguel Acosta | TACOM |
| 135 | 9,000,865 | Power dividing and power combining circuits | Eric Brett Compton | ARL |
| 136 | 8,997,944 | Automatic rope brake and lowering device | Roger C. Phillips | NSRDEC |
| 137 | 8,994,584 | Autofocus-based compensation (ABC) system and method for a hovering ground moving target indication (GMTI) sensor | Eric Brett Compton | ARL |
| 138 | 8,993,874 | Photonic bandgap solar cells | Michael K. Gray | AAMC |
| 139 | 8,991,263 | Fiber snubbing clamp using magnetic gripping action | Christos S. Kyriakou | ARL |
| 140 | 8,988,524 | Apparatus and method for estimating and using a predicted vehicle speed in an indirect vision driving task | Eric Brett Compton | ARL |
| 141 | 8,986,708 | Combinations of gene deletions for live attenuated Shigella vaccine strains | Law Firm | MRMC |
| 142 | 8,985,520 | Method of improved distribution over the surface of a parachute canopy | Roger C. Phillips | NSRDEC |

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| 143 | 8,985,025 | Submunition and cluster munition containing submunitions | Michael C. Sachs | ARDEC |
| 144 | 8,984,794 | Trigger guard roll pin tool | Michael C. Sachs | ARDEC |
| 145 | 8,983,303 | Quantum based information transfer system and method | Lawrence E. Anderson | ARL |
| 146 | 8,982,131 | Multivariate digital camera device and method for generating 2D and 3D pictures of datasets comprised of points in hyperspace | Ulysses John Biffoni | ECBC |
| 147 | 8,978,560 | Shock mitigation barrier for warheads | Henry S. Goldfine | ARDEC |
| 148 | 8,977,485 | Methods for robotic self-righting | Eric Brett Compton | ARL |
| 149 | 8,977,349 | Collection and analysis of vital signs | Elizabeth Arwine | MRMC |
| 150 | 8,973,565 | Device and method for inducing brain injury in animal test subjects | Elizabeth Arwine | MRMC |
| 151 | 8,966,993 | Three dimensional piezoelectric MEMS | Alan I. Kalb | ARL |
| 152 | 8,961,833 | Fluorinated carbon composite cathode for a high-energy lithium battery | Avrom David Spevack | ARL |
| | | | John H. Raubitschek | ARL |
| 153 | 8,955,442 | Flameless smoke pot | Ulysses John Biffoni | ECBC |
| 154 | 8,950,334 | Pre-deformed obturator for tube-launched projectile | Henry S. Goldfine | ARDEC |
| 155 | 8,950,332 | Expanding non-lethal munition | Henry S. Goldfine | ARDEC |
| 156 | 8,950,275 | System and method for tracked vehicle dynamometer testing | Luis Miguel Acosta | TACOM |
| | | | Thomas W. Saur | TACOM |
| | | | David L. Kuhn | TACOM |
| 157 | 8,948,539 | System and method for image improvement and enhancement | Lawrence E. Anderson | ARL |
| 158 | 8,946,637 | Compact fiber-based scanning laser detection and ranging system | Richard J. Kim | CECOM |
| 159 | 8,943,974 | Wall breaching fragmentation projectile | Michael C. Sachs | ARDEC |
| 160 | 8,943,972 | Liner release mechanism for anti-armor munitions | Henry S. Goldfine | ARDEC |

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| 161 | 8,943,942 | Anti-fratricide responsive ordnance system | Henry S. Goldfine | ARDEC |
| 162 | 8,942,851 | Talon robot integrated accessory device | Michael C. Sachs | ARDEC |
| 163 | 8,937,671 | Radial readout approach to EO imagers | Richard J. Kim | CECOM |
| 164 | 8,936,915 | Cleavage sensitive antibodies and methods of use thereof | Elizabeth Arwine | MRMC |
| 165 | 8,936,689 | Insensitive explosives and process therefore | Henry S. Goldfine | ARDEC |
| 166 | 8,935,035 | Advanced optimization framework for air-ground persistent surveillance using unmanned vehicles | Henry S. Goldfine | ARDEC |
| 167 | 8,933,383 | Method and apparatus for correcting the trajectory of a fin-stabilized, ballistic projectile using canards | Christos S. Kyriakou | ARL |
| 168 | 8,932,468 | Separation of enzymatically synthesized polyepicatechin via high performance liquid chromatography | Roger C. Phillips | NSRDEC |
| 169 | 8,925,882 | Mount for telemetry receiver | Ulysses John Biffoni | ECBC |

*Source*: Created by author after analyzing various patents in PatFT (http://patft.uspto.gov/netahtml/PTO/index.html ) and PAIR (http:// portal.uspto.gov/pair/PublicPair) as accessed from December 2, 2015 through February 15, 2016.

APPENDIX D

Interview with Army Material Command

## RE: Patent Research (UNCLASSIFIED)

Winborne, George O CIV USARMY USAMC (US)
**Sent:** Saturday, May 21, 2016 11:33 PM
**To:** Browne, Scott A MAJ USARMY CAC (US)

CLASSIFICATION: UNCLASSIFIED

MAJ Browne,

I repeat your questions and add my answers below:

1. What is your position with AMC?

Answer: My job title is Patent Attorney. I consider my position to be Intellectual Property Counsel for HQ Army Materiel Command.

2. How many patent applications are you aware of that were prosecuted by AMC patent attorneys and filed in Calendar Years 2013, 2014, and 2015 that have Soldiers as named inventors? By "Soldiers," I refer to Army servicemembers assigned to one of the Army Service Component Commands, FORSCOM, TRADOC, or USMA.

Answer: Filed and prosecuted in 2013, 2014 or 2015: Zero. I am aware of two filed prior to this period for which prosecution extended into this period.

3. I closely researched patents issued to the Army in Calendar Years 2013, 2014, and 2015. These patents of course do not correlate with those described above in Question 2, but do you have any indication that any of these patents have Soldiers as named inventors?

Answer: No.

4. Do you consent that this message and your response be included as an appendix to my thesis?

Answer: Yes.

V/r,

George O. Winborne
Patent Attorney
Building 4400 A6SE058
AMCCC-BBI
Office of Command Counsel
US Army Materiel Command HQ
Redstone Arsenal, AL 35898-5000

-----Original Message-----
From: Browne, Scott A MAJ USARMY CAC (US)
Sent: Friday, May 06, 2016 3:03 PM
To: Winborne, George O CIV USARMY USAMC (US)
Subject: Patent Research

Hello Mr. Winborne,

The purpose of this message is to record your answers to questions related to Soldier-inventors. I am researching the extent that Soldiers are listed as named inventors throughout the patent application process. This research is in support of the Command and General Staff College's accredited Master of Military Art and Science (MMAS) program. MMAS theses are publicly accessible at the following website: http://cgsc.contentdm.oclc.org/cdm/landingpage/collection/p4013coll2.

The questions I ask below are only seeking factual information. It is intended that, with your consent, this email and your response will be included as an appendix to my thesis. This method affords a reader of the thesis a full account of any information I attribute to yourself.

1. What is your position with AMC?

2. How many patent applications are you aware of that were prosecuted by AMC patent attorneys and filed in Calendar Years 2013, 2014, and 2015 that have Soldiers as named inventors? By "Soldiers," I refer to Army servicemembers assigned to one of the Army Service Component Commands, FORSCOM, TRADOC, or USMA.

3. I closely researched patents issued to the Army in Calendar Years 2013, 2014, and 2015. These patents of course do not correlate with those described above in Question 2, but do you have any indication that any of these patents have Soldiers as named inventors?

4. Do you consent that this message and your response be included as an appendix to my thesis?

Thank you so much Mr. Winborne for all of your feedback and guidance throughout this research process!

Sincerely,

Scott A. Browne
MAJ, EN
Student, SG4C
US Army Command & General Staff School
Lewis & Clark Center, Fort Leavenworth, KS

APPENDIX E

Interview with Edgewood Chemical Biological Center

**RE: Introduction / Research Question**

Biffoni, Ulysses J CIV USARMY RDECOM (US)
**Sent:** Friday, May 20, 2016 12:39 PM
**To:** Browne, Scott A MAJ USARMY CAC (US)
**Cc:** Biffoni, Ulysses J CIV USARMY RDECOM (US)

MAJ Brown,

I have no objection to including my email however you prefer to do so. By the way, I noticed I inadvertently omitted a word in my email. In the third paragraph, it should read, "To the best of my recollection, I have had very "few" cases that included soldier-inventors over the past 22 years here at ECBC." The word "few" was omitted.

Best Regards,
John

John Biffoni
Patent Attorney and IP Counsel
IP Law Team/RD&E Edgewood Division
AMC Legal Center - APG
Bldg. E3330, Rm. 242
Aberdeen Proving Ground, MD 21010

-----Original Message-----
From: Browne, Scott A MAJ USARMY CAC (US)
Sent: Thursday, May 19, 2016 9:29 AM
To: Biffoni, Ulysses J CIV USARMY RDECOM (US) <ulysses.j.biffoni.civ@mail.mil>
Subject: RE: Introduction / Research Question

Hi, good morning Mr. Biffoni,

We spoke a few months ago regarding the extent that Soldiers are involved in the inventorship of the Army's patents. You kindly provided feedback specific to ECBC's patents (below). Thank you again for your feedback. As I close out my thesis on Soldier-inventors, I would like to cite some of the factual information you provided. I can either include this entire email in one of my appendices and cite it in the text, or just simply cite the email without including it as an appendix.

I'd prefer to include this email in its entirety to avoid any factual information getting taken out of context, but I respectfully defer to your preference.

The theses are posted at this location:
http://cgsc.contentdm.oclc.org/cdm/landingpage/collection/p4013coll2

I'm glad to forward you the thesis once it is complete and released if you are interested.

Thank you sincerely Mr. Biffoni.

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From: Biffoni, Ulysses J CIV USARMY RDECOM (US)
Sent: Friday, February 05, 2016 1:00 PM
To: Browne, Scott A MAJ USARMY CAC (US)
Cc: Upchurch, Vicki A CIV USARMY RDECOM (US); Biffoni, Ulysses J CIV USARMY RDECOM (US)
Subject: RE: Introduction / Research Question

Hello MAJ Browne,

Yes, I prosecute all of ECBC's patent applications. Just to make one minor correction, the number of patent applications prosecuted in any given year, and the number of patent applications that issue as patents in that year are not the same. So, you are correct that 19 ECBC patents issued in that calendar year, but the number of patent applications I prosecuted in that year is a probably greater than 19. A typical patent application is pending and being prosecuted before the USPTO for 2-3 years.

All of the inventors named on the ECBC patents you listed are DA civilians assigned to ECBC or civilian contractor employees who have assigned title in the invention to the United States (U.S. Army) through their contractor employer. The patents cited do not have any soldier-inventors.

To the best of my recollection, I have had very cases that included soldier-inventors over the past 22 years here at ECBC. I can recall one case that included a LTC (professor I believe) from West Point who had collaborated with ECBC scientists and was named as a co-inventor.

In summary, all of the inventors named on the patents you provided are either civilians assigned to ECBC or contractor employees working with ECBC who have directly or indirectly assigned their invention rights to the United States (U.S. Army). I hope this helps and let me know if you need anything further.

Best Regards,
John

John Biffoni
Patent Attorney and IP Counsel
IP Law Team/RD&E Edgewood Division
AMC Legal Center – APG
Bldg. E3330, Rm. 242
Aberdeen Proving Ground, MD 21010

-----Original Message-----
From: Browne, Scott A MAJ USARMY CAC (US)
Sent: Friday, February 05, 2016 11:15 AM
To: Biffoni, Ulysses J CIV USARMY RDECOM (US)
Subject: Introduction / Research Question

Hello Mr. Biffoni,

My name is Major Scott Browne and I am pursuing a Master of Military Art and Science degree through the Command and General Staff College at Fort Leavenworth. As part of this degree's requirements, I am writing a thesis on the integration of Soldiers, assigned to either FORSCOM, TRADOC, or one of the Army Service Component Commands, into the Army's patent application process. In support of this research, I am analyzing the patents issued to the federal government, as represented by the Secretary of the Army (i.e. issued to the US Army). Specifically, as for patents prosecuted by the Edgewood Chemical Biological Center (ECBC) in calendar year (CY) 2015, I am making the assumption that you prosecuted all of ECBC's patents. Is that correct?
If so, in CY 2015, as best understood, ECBC prosecuted 19 patents issued to the US Army. A total of 40 different inventors are named on these 19 patents. Five of these inventors (e.g. Mr. Terrence G. D'Onofrio) were named on more than one patent. My question for you Sir is how many of these inventors are Soldiers not assigned to ECBC, or more generally, AMC? In other words, is every inventor named on patents prosecuted by ECBC, and issued by the USPTO, in CY 2015, assigned to ECBC either permanently or contractually?

For your reference, please find attached to this message a list of ECBC patents, based on the assumption above, issued in CY 2015 with the inventors identified.

Of course, if there is a more appropriate point of contact for this question, I'll gladly contact them with this question.

Also, I'm glad to discuss this over the phone if that is more convenient for you Mr. Biffoni.

Thank you so much for any help you can offer for this research!

Most sincerely,

Scott Browne

Scott A. Browne
MAJ, EN
Student, SG4C
US Army Command & General Staff School
Lewis & Clark Center, Fort Leavenworth, KS

# BIBLIOGRAPHY

## Books


Carafano, James J. *GI Ingenuity: Improvisation, Technology, and Winning World War I.* Westport, CT: Praeger Security International, 2006.

Christensen, Clayton M. *The Innovator's Dilemma*. New York: Harper Business School Press, 1997.

Clausewitz, Carl. *On War*. Edited and Translated by Peter Paret and Michael Howard. Princeton, NJ: Princeton University Press, 1989.

Doubler, Michael D. *Closing with the Enemy: How GIs Fought the War in Europe, 1944-1945*, Lawrence, KS: University of Kansas Press, 1994.

Fuller, J. F. C. *Armament and History: The Influence of Armament on History from the Dawn of Classical Warfare to the End of the Second World War*. New York: De Capo Press. 1998.

Hackworth, David, and Julie Sherman. *About Face: Odyssey of an American Warrior*. New York: Simon and Schuster, 1989.

Handel, Michael I., ed. *Clausewitz and Modern Strategy*. London: Frank Cass and Company, 1986.

Hoffman, Jon T., ed. *A History of Innovation: U.S. Army Adaption in War and Peace.* Washington, DC: Center of Military History, 2009.

Isaacson, Walter. *Benjamin Franklin: An American Life.* New York: Simon and Schuster, 2003.

———. *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*. New York: Simon and Schuster, 2014.

Liyanage, Shantha. *Serendipitous and Strategic Innovation: A Systems Approach to Managing Science-Based Innovation*. Westport, CT: Praeger Publishers, 2006.

Murray, Williamson, and Allan R. Millett, eds. *Military Innovation in the Interwar Period*. Cambridge, UK: Cambridge University Press, 2006.

Nard, Craig A. *The Law of Patents*. New York: Aspen Publishers, 2008.

Poltorak, Alexander I., and Paul J. Lerner. *Essentials of Intellectual Property: Law, Economics, and Strategy*, 2nd ed. Hoboken, NJ: John Wiley and Sons, 2011.

Schein, Edgar H. *Organizational Culture and Leadership*. Hoboken, NJ: Jossey-Bass, 2010.

Zenko, Micah. *Red Team: How to Succeed by Thinking Like the Enemy*. New York: Basic Books, 2015.

Government Documents

Department of Defense. *Quadrennial Defense Review 2014*. Washington, DC: Government Printing Office, 2014.

Headquarters, Department of the Army. Army Doctrine Publication 3-0, *Unified Land Operations*. Washington, DC: Government Printing Office, 2011.

———. Army Doctrine Publication 6-0, *Mission Command*, Change 2. Washington, DC: Government Printing Office, Department of the Army, 2012.

———. Army Doctrine Publication 5-0, *The Operations Process*. Washington, DC: Government Printing Office, Department of the Army, 2012.

———. Army Regulation 27-60, *Intellectual Property*. Washington, DC: Government Printing Office, 1993.

———. Army Regulation 135-7 *Army National Guard and Army Reserve Incentive Programs*. Washington, DC: Government Printing Office, 1996.

———. Army Regulation 672-20, *Incentive Awards.* Washington, DC: Government Printing Office, 2014.

———. Army Techniques Publication 5-0.1, *Army Design Methodology*. Washington, DC: Government Printing Office, 2015.

———. Department of the Army Pamphlet 27-11, *Army Patents*. Washington, DC: Government Printing Office, 1979.

Training and Doctrine Command. Training and Doctrine Command Pamphlet 525-3-1, *The U.S. Army Operating Concept-Win in a Complex World*. Fort Eustis, VA: U.S Government Printing Office, 2014.

United States Patent and Trademark Office. *Manual of Patent Examining Procedure*. 9th ed., rev. 07.2015. Alexandria, VA: United States Patent and Trademark Office, 2015.

U.S. Patents

Evangelisti, Matthew and Steve Kotefski. *Grenade Pull Pin Assembly*. U.S. Patent No. 8,789,469. Alexandria, VA: U.S. Patent and Trademark Office, 2014.

Freitag, Ryan, Cameron Martin, Patrick Cae, Kevin Lucas, Brian Walter, and Christopher Knittle. *Gun-Launched Anchor Projectile for Climbing*. U.S. Patent No. 9,074,856. Alexandria, VA: U.S. Patent and Trademark Office, 2015.

J.C. Garand. *Semiautomatic Rifle*, U.S. Patent No. 1,892,141, Washington, DC: U.S. Patent and Trademark Office, 1932.

Nguyen, Lm Huy and Trac D. Tran. *Method and System for Removal of Noise in Signal.* U.S. Patent No. 9,172,476. Alexandria, VA: U.S. Patent and Trademark Office, 2015.

Reifman, Jacques, Maxim Khitrov, Andrew Reisner, Liangyou Chen, and Thomas McKenna. *Collection and Analysis of Vital Signs*. U.S. Patent No. 8,977,349. Alexandria, VA: U.S. Patent and Trademark Office, 2015.

Lectures

Brown, Robert, Lieutenant General. "The Human Dimension." Speech to the Command and General Staff College, Fort Leavenworth, September, 11, 2015.

———. "Advice to Field Grade Officers." Speech to the Command and General Staff College, Fort Leavenworth, April 29, 2016.

Dailey, Daniel, Sergeant Major of the Army. Speech to the Command and General Staff College, Fort Leavenworth, March 22, 2016.

Internet Databases

Department of Defense, Joint Advertising Market Research and Studies. "Ad Tracking Wave 41 Army Presentation: Department of Defense Advertising Tracking Study, Overview of Wave 41 Results (April-June 2013)" 2013. Accessed March 24, 2016. http://dmren.org/app/mrs /advertising-tracking-and-effectiveness/studies /advertisingtracking-study-mdash-active-duty/1337273006.

United States Patent and Trademark Office. Patent Application Information Retrieval. Accessed December 14, 2015. http://portal.uspto.gov /pair/PublicPair.

United States Patent and Trademark Office. "Patent Full-Text Image Database. Accessed December 14, 2015. http://patft.uspto.gov/netahtml/PTO/index.html.

Periodicals/Journals

Brody, Tom. 2014. "Functional Elements in Patent Claims, as Construed by the Patent Trial and Appeal Board (PTAB)." *John Marshall Review of Intellectual Property.* Accessed May 8, 2016. http://repository. jmls.edu/cgi/viewcontent.cgi?article= 1323&context=ripl.

Cohen, Wesley, Richard Nelson, and John Walsh. “Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not).” *National Bureau of Economic Research,* 2000. Accessed May 2, 2016. http://www.nber.org/papers/w7552.

Faith, Kay Sullivan. “Patterns of Creation and Discovery: An Analysis of Defense Laboratory Patenting and Innovation.” Dissertation, Pardee Rand Graduate School, 2013. Accessed December 14, 2015. http://www.rand.org/pubs/rgs_dissertations/RGSD321. html.

Hahn, Robert. “Economics of Patent Protection: Policy Implications from the Literature.” AEI-Brookings Joint Center for Regulatory Studies, 2003. Accessed April 3, 2016. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=467489.

Hall, Bronwyn. “The Use and Value of Patent Rights.” Strategic Advisory Board for Intellectual Policy, Intellectual Property Office, 2009. Accessed May 2, 2016. http://www.uspto.gov/sites/default/files/aia_implementation/ipp-2011nov08-ukipo-2.pdf.

———.“The Use and Value of Patent Rights,” Strategic Advisory Board for Intellectual Policy, Intellectual Property Office, 2009. Accessed May 2, 2016. http://www.uspto.gov/sites/default/files/aia_implementation/ipp-2011nov08-ukipo-2.pdf.

———.“Overview of my Research on Innovation.” UC Berkely and University of Matich, 2014. Accessed April 26, 2016. http://eml.berkeley.edu//~bhhall/papers/BHH14_research%20on%20innovation_Singapore.pdf.

———.“Policy for Innovation: Insights from Economic Research.” *Innovation Policy-Puerto Rico*, 2014. Accessed April 29, 2016. http://eml.berkeley.edu//~bhhall/papers/BHH14_PR_innov_policy.pdf.

Hall, Bronwyn, Christian Helmers, Mark Rogers, and Vania Sena. “The Choice Between Formal and Informal Intellectual Property: a Review.” National Bureau of Economic Research Working Paper Series, April, 2012. Accessed May 2, 2016. http://www.nber.org/papers/w17983.pdf.

Hill, Andrew. “Military Innovation and Military Culture.” *Parameters* 45, no. 1 (Spring 2015): 85-98. Accessed April 20, 2016. http://www.strategicstudiesinstitute.army.mil/pubs/Parameters/Issues/Spring_2015/10_HillAndrew_Military%20Innovation%20and%20Military%20Culture.pdf.

Merges, Robert P., and Richard R. Nelson. “On the Complex Economics of Patent Scope.” *Columbia Law Review* 90 (1990): 839-916. Accessed April 24, 2016. http:// scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=2690&context=facpubs.

Pierce, James G. “Is the Organizational Culture Of the U.S. Army Congruent with the Professional Development of its Senior Level Officer Corps?.” Letort Papers, Strategic Studies Institute, Carlisle, PA, September, 2010. Accessed April 12, 2016. http://www.strategicstudies institute.army.mil/pubs/display.cfm?pubID=1015.

Premo, John. “Some Intangible Benefits of the Patent System,” *Journal of the Patent and Trademark Office Society* 41 (1959).

Other

Pierre Chao, Interview by Army AL&T Magazien. “What Kind of Innovation do you Want?” *Army AL&T Magazine*, 2015. Accessed October 12, 2015. http://usaascinfo.info/docs/armyalt-oct-dec-15-o.pdf.

Hixon, Todd. “For Most Small Companies Patents are Just About Worthless.” *Forbes Magazine*, October 4, 2013. Accessed May 2, 2016. http://www.forbes.com/sites/ toddhixon/ 2013/10/04/for-most-small-companies-patents-are-just-about-worthless/#aefcc2316abb.